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MINING AND METALLURGY — ESTABLISHED 1866

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EDITORIAL.

READERS WILL have noticed the change in the size of our page, which began with the issue for January 5, the first of the new volume. In the present number, some further alterations in the arrangement of the paper are made. Their object is to present the matter in better order, and also to make it possible to bring the market information and the editorial comment up to the latest possible date. Of course, any change in the form and arrangement of a paper is a little disturbing at first to anyone who has been long accustomed to another style. We believe, however, that our subscribers will soon become used to the new arrangement of the JOURNAL and will find it more convenient than the old. We think that the smaller page, especially, will be found a more convenient size for reading, and also for binding. The width of column is such as to obviate the shifting of the eye, the lines being of a length covered at a glance when held at the usual distance. We may add that the reduction in size is accompanied by an increase in the number of pages, so that rather more reading matter than before is included in each number. Standardization is the aim of modern industry, because it conduces to convenience and economy. This JOURNAL now appears in the size accepted as standard by the technical press of America.

THE DIRECTOR of the Mint appears to have perplexed some of our contemporaries. In giving the estimates of gold and silver production in the United States, he added, at the bottom of the statistical table, the output of the Klondike and that of Nome. As a consequence *The Evening Post*, for instance, adds the yield of gold from the Klondike, which is in Canada,

and that of Nome, already included in the amount credited to Alaska, arriving thereby at the grand total of $99,729,800 for the whole country, instead of $84,551,300, which is the correct, and sufficiently satisfactory, value of the gold production.

THE EXPOSURE of the methods by which the stock of the Montreal & Boston Copper Company masqueraded as an active security on the curb market, is likely to hurt speculative zeal. It may have been only a vulgar imposture; but the manner in which three million shares were recorded as bought and sold through fictitious transfers, throws an unpleasant light on the underhand way by which big transactions are made to appear, also, on the records of the Stock Exchange. During the last three months of 1904, no less than 92,000,000 shares were dealt in; how many of these were "wash sales"? The pity of it is that dirty little transactions by men who fail, provoke derision; but the buccaneering tactics of big operators pass for shrewd business. An important bank was mixed up in the Montreal & Boston mess; where is the line that separates low finance from high finance? Episodes such as these give strength to the loud vaticinations of Mr. Lawson; a man need not be a major prophet to make simple people anxious over investment in a market which plays the game according to no code.

AT MT. LYELL, Tasmania, ore carrying 2.35 per cent copper is smelted in hot-blast furnaces to a 15 per cent matte, the concentration being 6 to 1. The coke is only 5 per cent of the ore; or 3.5 per cent of the total charge. The slag is rather basic, running about 38 per cent silica, and 46 per cent iron; and is clean, carrying only 0.3 per cent copper. The first matte is concentrated to a 50 per cent copper product in a smaller hot-blast furnace with the same coke consumption. This concentration of a low- to a high-grade matte in a blast furnace, even with much limestone in the charge, is unique; for usually matte is not essentially changed by re-fusion without calcining. The 50 per cent matte is then converted to a blister carrying 98.8 per cent copper. The total cost for mining, removal of overburden, smelting and converting is $4.73, which certainly is a worthy record, although in terms of money it is surpassed by the Granby mine, in the Boundary district of British Columbia. Not every one can raise low-grade matte to high-grade by re-fusing, even in a hot-blast stack-furnace. The result is worthy of wider application.

THE ARTICLE on the Mesabi Iron Range, which we publish on another page, is the first of a series which will give the history and description of a region which is both geologically interesting and economically of the highest importance. The ores of the Mesabi range now furnish the raw material for more than 40 per cent of the iron made in the United States, and their production appears to be capable of still greater expansion. In fact, they must constitute in a few years the mainstay of our iron and steel industries, so that no mining district of the United States is of greater present importance to the industrial prosperity of the country. The author of these articles has been familiar with the Mesabi since the first discovery of ore there, and has been constantly identified with the growth of the region, so that he is thoroughly familiar with its past and present conditions.

THE MUTUAL DEPENDENCE of mechanical engineering and chemistry is being emphasized by the obstacles encountered in the application of the principle of re-grinding. Slime plants, recently erected in South Africa, have proved such expensive installations, that the enthusiasm of advocates of the new metallurgy has been dampened. Poor methods of construction have entailed a waste of money, as at the Ferreira Deep; while the aid of experienced designers of machinery has prepared the way for success, as at the Village Deep mine. It is likely that this new departure in cyanidation will accentuate the fact that the true metallurgist is he who applies chemical knowledge under conditions favorable to economic manipulation. It is the combination of artist and carpenter which makes the architect.

A BLAST FURNACE slag carrying only 0.3 per cent copper may seem to be quite clean. But it must be remembered that the slag roughly amounts to ten times the weight of the matte. Now, multiplying the figure given above by 10, shows a loss of 3 per cent, which is altogether too high to tolerate. The reverberatory slag is usually charged with a still greater waste, 4 or 5 per cent. The loss in tailing, sand and slime, from the ordinary concentrator of copper ore is frequently 25 or 30 per cent. All these easily make up 30 to 40 per cent loss on copper. These are the conditions in some representative reduction works. Evidently there is still opportunity for invention. It is the large, but low-grade ore deposit which affords the foundation for the soundest mining and metallurgical enterprise; but to command success, there is demand for economy, not only in working, but particularly in saving the metal.

AMONG RECENT MINING enterprises is the Douglas Copper Company, named after Mr. Theodore Douglas, a gentleman whose name is a sufficient guarantee for the proper conduct of operations. But many people are apt to associate the name of Douglas in copper mining, with the technical authority who directs the industrial activities of Phelps-Dodge & Company; Mr. James Douglas, moreover, has covered a wide field, from the invention of the old Hunt-and-Douglas process to the delivery of stimulating public addresses; but he is not the eulogist of Watts-Dunton, and he is not connected with the Douglas Copper Company. On the whole, we think it a pity to name mining undertakings after individuals; Capt. De La Mar has confused the geography of the West, by giving his name to a mine in Idaho, and to a town in Nevada. A town in Utah is named after Mr. Samuel Newhouse, and so also is a well-known adit in Colorado. Col. W. C. Greene has affixed his name to a copper enterprise and also to a gold mine, affording chances for mistakes. There is nothing descriptive in these christenings; they appear to be a symptom of that self-assertion which has caused many hotels to serve as tombstones to the men who spent fortunes to build them.

THE COAL SUPPLY of California in 1904, as reported on another page, shows a decrease of 164,482 tons, or 13.5 per cent, as compared with the previous year. This is not, as might be supposed, an indication of business depression on the Pacific coast; on the contrary, the demand for fuel for manufacturing purposes increased. It was, however, largely supplied by the use of oil, which is now the staple steam-fuel of California, being used there to a greater

extent than anywhere else in the world, except in South Russia.

Of the coal used in California last year, 52.3 per cent was imported, chiefly from British Columbia and Australia. Eastern coal has a very small share of the trade, less than 3 per cent of the total; much less, in fact, than British coal, which is favored by a very low ocean freight.

REFERRING TO a recent article on "Iron Ore in South Africa," we are informed by the Commissioner of Mines that some of the coals of Natal do make excellent coke, and that large deposits of iron ore exist in that flourishing colony.

THE ARTICLE on 'Tennessee Phosphate,' appearing in our issue of December 29, was written by Mr. John Ruhm, Jr., and not by Mr. H. D. Ruhm. We gladly make this correction.

Chemical Prediction.

Chemical prediction finds many illustrations, not only in the field of carbon chemistry (where nice synthesis works out thousands of anticipated derivatives), but also in the history of the elements themselves. In the sixties, Mendeléeff predicted several unknowns, which subsequently appeared and were named, respectively, scandium (eka-boron), gallium (eka-aluminum), and germanium (eka-silicon). Mendeléeff's prediction regarding these three elements was correct to, say, 90 or 95 per cent of the facts.

But the opportunity for prediction is by no means exhausted. If any one wishes a good examination paper in comparative inorganic chemistry, let him predict the properties of the unknown, next in atomic weight order, namely, eka-manganese. It is below manganese, follows molybdenum and precedes ruthenium. Its atomic weight will be near, and below, 100. It should be a gray metal, possibly occurring both native and combined. It should have sp. gr. of a little over 9. It should have several stages of oxidation, the lower ones acting as bases (and possibly as reducers), and the higher as acids (and perhaps as oxidizers); and so the statement might be extended indefinitely. It is strange that no trace of this missing element has yet been recognized, though the search has been conducted for nearly 40 years. Eka-manganese is only one of many waiting riddles in inorganic chemistry. Indeed there is room for 20 certainly, and perhaps 30, more unknown elements in the periodic sequence; but none offers a basis for prediction equal to that presented by eka-manganese.

Rand Metallurgy.

The proposal of Mr. Denny to slime everything and to cease the independent treatment of concentrate, sand and slime is meeting with favor. There is no doubt that concentrate, if ground sufficiently fine, offers no difficulty to the ordinary filter-press cyanide method; though there seems to be room for decided improvement in the saving of dissolved gold adhering to the cake, as pointed out by Mr. Charles H. Fulton in the review we published last week.

While it is admitted that general re-grinding will secure better extraction, the opponents of the scheme argue that this benefit will not balance the increased cost. This remains to be proved. Careful analysis indicates that the bulk of the gold lost in tailing is contained in the coarse particle; for example, a grading analysis of sand residue from an original charge of 4 dwt., showed that 35 per cent to 45 per cent of the particles assaying 1.75 dwt. remained on a 60-mesh sieve; about 15 per cent to 20 per cent passed a 200-mesh sieve, and this portion contained 0.2 dwt. per ton. It is apparent that any method that aids amalgamation is a step in the right direction. Amalgamation is the simplest form of gold-saving by chemical method, for amalgam is more cheaply amenable to refining than any precipitate. In 1899, the average actual recovery by amalgamation was 66 per cent; it is now believed that, by sliming the whole product, an improvement of 10 per cent can be attained, the importance of which is in direct ratio to the size of the gold mining industry of the Rand.

The proposal to slime everything contemplates a consolidation of plant. At the present time arrangements must be made to remove residue from both the sand and slime-plants; dams must be built, and material must be lifted, occasionally to a considerable height. In the decantation method, a great volume of water has to be handled. This will be immensely reduced by the adoption of the filter-press; filter-pressing can be included with agitation in one plant. The distribution of men and material over a widespread acreage of apparatus can be largely obviated.

Although the cost of re-grinding is an addition, nevertheless, by permitting of coarser crushing under the stamps, it lessens the expense of this preliminary operation to such an extent as to afford a credit to the tube-mill. Thus, the actual horsepower to reduce to 200-mesh, under the combined pulverization of stamp and tube, is a great deal less than the horsepower required to produce such a result in the stamp-mill. But just as the stamp is ill adapted to such fine comminution, so also the tube is not built for coarse work. At the Glen Deep, one of the subsidiaries of the Rand Mines, Ltd., a tube-mill has been used for the specific purpose of re-grinding classified products, and the screening has been reduced to 8-mesh. It is not to be expected, in the light of Kalgoorlie experience, that the tube-mill should do its best work under such conditions; and, just as with rolls successive crushing in stages gives in the cheapest way the most uniform product, so also in grinding a graduated treatment is the best procedure. All the stamp-mill product will not go to the tube; part of it is already fine enough, and this should be separated by screening. A system of successive elimination is the corollary to graduated pulverization. In Western Australia, the Wheeler pan is used for the coarser grinding; but it is likely that the new Huntington will be found even better, if Lake Superior experience counts for anything. All these factors work for the three desiderata—less initial outlay in plant, greater extraction and lower working cost, the net result being larger profit, the aim of all practical metallurgy.

Ore: a Definition.

Technical men in the Lake Superior region call the product of their mines 'copper rock,' and demur to the use of the term 'ore'; indeed, this view is taken by a few well-informed gentlemen in New York, who quote as authoritative the definition that says, "ore is a mineral which is a chemical *compound* of a useful metal with some other element or acid." According to this view, since the copper in the Michigan lodes exists in a metallic condition, the native mineral or its enclosing rock remains simply 'rock'; if the copper were present as a sulphide, it would be 'ore.' So does a professorial tradition persist.

The significance of words is determined by usage. The hard exterior of the earth is 'rock'; it is differentiated by seams or

lodes or veins from which man extracts the mineral substances he needs for art and industry. The valuable portions constitute 'ore.' In the case of gold, we have to deal usually with a metal in its native state, for gold is not known to exist as a compound, save in tellurides. Is a rock containing a telluride an 'ore,' and does it become 'rock' when oxidation has set free the precious metal? We hold that 'ore' is mineral or rock, whether element or compound, from which the metal can be profitably extracted; if it is so poor or so refractory that it cannot be profitably benefitiated, it is called 'waste.' A lode traverses 'rock'; it is itself built of differentiated rock; that part which is commercially valuable is 'ore,' the remainder is 'waste.' By cheaper mining or better metallurgical treatment, 'waste' may become 'ore'; by extravagant management or lowering of metal prices, 'ore' may have to be transferred to the category of 'waste.' 'Copper rock' is an awkward provincialism; so also is the term 'stone,' used in Australia.

Market Conditions.

Jan. 11.

The metal markets are generally quiet, a condition which is very apt to be found in the first week of the new year. Purchasers seem to be taking a rest and waiting to see how matters will shape themselves. In copper comparatively little has been doing by domestic consumers, who seem to be fairly supplied for the time being, but manufacturers are generally busy and the outlook is good. For export, there is considerable inquiry for Europe, and more buying is going on for the Far East.

Tin is quiet, with only a moderate business doing. The same condition exists in lead. Spelter is still strong, and purchasers seem to be inclined to take metal at the advance, probably fearing a further increase.

Silver has been rather dull, and prices have receded since the close of the year.

The iron and steel markets are also temporarily quiet, with comparatively little new buying. Mills and furnaces are generally busy, however, and there is no disposition to look for reduced business. In fact, preparations are being made on all hands for a large trade.

The Western coal markets are in rather an unsettled condition, and there are some signs that overproduction is affecting the trade. The demand for steam coal is fair, but prices are heavy, and coal is offered in some places at a very low figure.

The seaboard bituminous trade is steady, with good demand for coal and prices well maintained. There is still some difficulty in rail shipments, and consumers are inclined to complain of slow deliveries.

The anthracite coal trade is quiet and steady, with very few changes to report. Demand continues good for both domestic and steam sizes of coal.

Metallics.

Culled from all sources. Our readers are invited to assist this department by sending similar material.

An interesting instance of the union of commerce and education is presented in the action of an American company which sells largely in Russia. The firm has established a technical school at Omsk to instruct the people in the use of its agricultural implements which find a good market in that region. The example might perhaps be emulated by manufacturers of mining and metallurgical machinery.

The carbon filaments of incandescent lights are made of various substances. Some employ cotton, some a bamboo fiber or a grass, while a platinum wire, on which carbon is deposited, has been used by others. Of late, filaments are commonly made long with extra turns or curves, designed to throw more light downward or sideways, as may be required.

By repeated precipitation and re-dissolving of a solution containing lead, bismuth and tellurium with some radio-active substance, the radio-activity was successively associated with the lead, the bismuth (as polonium) and the tellurium. Thus it appears that radio-lead, polonium and radio-tellurium, so called, cannot be distinguished and identified by chemical reaction, but recourse must be had to the nature of the respective radiation.

The temperature of the metal in steel casting is very important, hotter metal being more necessary for small intricate molding than for thick, heavy castings. If the metal is a little too hot, however, there is a danger of blow-holes and unsound casts, owing to the greater degree of contraction involved. If the temperature is too low, the molds may not be filled completely, and surfaces are apt to be defective.

Transvaal Gold Mines.*

By J. H. Curle.

These mines are destined to become the basis of an immense industry, and—now that an ample labor supply is arranged for—a rapidly increasing output of gold. With no hitch occurring in the supply of Chinese, we may expect that every month of 1905 will show a bigger output than the last, and that by May or June the old record of August, 1899, will be reached and passed. To expand the theme, I may again say that I expect the banket beds of the Transvaal will yield a thousand millions sterling; that some day there will be 15,000 stamps at work on the Rand, crushing 25,000,000 tons a year, and that the yield of gold from this, at a recovery of 33s. a ton, will reach the great figure of £41,250,000.

That is the industrial side of the question. As an industry it is difficult to exaggerate the Rand's possibilities, and I have nothing but praise for it. But the financial side of the question is another thing; as regards that I must, without ambiguity, adhere to my opinion—which is that most of the individual mines are over-valued. If the thousand millions lying in the ground were to be all profit, if even half were to be profit, I should to-day say that Kaffir shares were at least attractive speculations; but the net profit, after the Rand shall have been worked out, and all the failures set against the successes, will be no such figure. I do not say *every* mine on the Rand is over-valued; far from it. In due course I hope to refer to the mines individually, and distinguish between them. But *most* are, and most of the new things promise to be so.

Whether Rand shares are over-valued or not, it is only fair to point out that they are influenced by sentiment much more than other mining shares, and that they are liable to rise greatly in price for reasons not connected with their intrinsic value. It seems, indeed, probable that a big upward movement is now in course of taking place, and that the pendulum of speculation is definitely swinging in the way that so many want it to swing. The rapid expansion of the industry, consequent on the influx of labor, and the steady increase in the output of gold from the Transvaal, will no doubt attract world-wide attention. The layman, anxious to gamble in something, cannot be expected to look only at the unfavorable side of this great industry, and if 100,000 people in Europe, noting during the next six months the rapid increase in the output, decide that conditions are favorable for a little gamble, there will be a rise in prices.

'Sherardizing' consists in covering iron and steel with a plumbago coating, charged with zinc dust and about 3 per cent of carbon.

*The Economist, London, Dec. 31, 1904.

DISCUSSION.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the columns of THE ENGINEERING AND MINING JOURNAL.

THE LOGIC OF VALUATION.

The Editor:

SIR—Your editorials in connection with the recent gyrations of certain stocks, are directly to the point. "So the people may know" is more than a passing phrase; but the question is how to accomplish the desired publishing of business data. It is quite posible that Mr. Rockefeller and Col. Greene and other directors may realize the truth of the saying of the Good Book, namely, "Men love darkness rather than light, because their deeds," etc.; and they may also suffer keenly from the suspicion, perhaps unjustly, but certainly naturally, cast upon them by the curious and interested public. Now long continuance of power may render even a good man wilful and imperious, so that like old Falstaff, he may declare, "If reasons were as plenty as blackberries, yet would I give no man a reason upon compulsion." This being so—is it possible to show that it is to the interest, no less of the director than of the investor, that public matters be conducted in a public way? It is not for me to presume to forecast how this millennial end may be attained, the avoiding of the survival of the unfit; but I would suggest that one way is to continue, steadfastly and patiently, in the policy you have already outlined in the JOURNAL, namely, the insistence on the part of the investor that he be furnished a statement of fact whereon to invest. This will tend to diminish the number of careless speculators, and to increase the careful investors, which I suppose is one chief end of good business.

RUSTICUS.

Boston, Dec. 16, 1904.

MINE SAMPLING.

The Editor:

Sir—In October last I wrote you a description of my sampling bucket (published in the JOURNAL for December 1) and since then it has struck me that I neglected to mention one or two important details to be observed in their construction.

The ends of the piece of canvas forming the sides, after being sewed together to make the joint, should be doubled in and the whole sewed down flat, so as to make a smooth surface on the inside. The joint between the bottom and the sides had best be on the outside and bound with strong tape. There will be then only one seam on the inside of the bucket. The hoop forming the mouth is preferably made solid. That is, the ends should be welded together. If that is not obtainable the ends of the iron should be bent back on themselves to make a link joint. This will answer the purpose. As sharply pointed pieces of stone fall into the bucket and it gets very rough handling generally, only the strongest possible canvas is to be advised.

I have recently had occasion to sample several hundred thousand tons of slags, the result of smelting operations carried on by the Chinese for many hundred years. In order to sample these old slags and estimate the quantity, the slags being spread out for several miles along a valley, in irregularly shaped piles, of varying height, it was necessary to sink a great number of small pits. Owing to the lay of the ground and disposition of the slags, trenching was out of the question. In the bottom these holes were often not 18 in. diam., so that a candle box could not have been used at all, a box of any kind very awkward, and a canvas laid in the bottom useless. The sampling bucket answered the purpose completely. In the bottom of the hole it could be flattened out, so that the very lowest portion could be sampled, if there was even half an inch of space excavated below it. It can readily be imagined what a great saving was made by the use of these buckets, allowing a much smaller excavation and a much shallower one. The stuff on the sides of the hole was very loose and tended to come away with the least provocation, so that the smaller the hole the better.

C. S. HERZIG.

Mandalay, Burma, Nov. 20, 1904.

CHEMISTRY OF SULPHIDE SMELTING.

The Editor:

Sir—The tags on the chemical equations in my letter of September 22 became displaced, making me say unwarrantable things. I had no idea of offering my explanation of the compatibility of coke with pyritic smelting in any but a conjectural or tentative way, while supporting as strongly as possible my view of the fundamental reaction, which I have always represented by the equation:

(B) $2FeS+SiO_2+O_2=(FeO)_2SiO_2+S_2$.

I have, for several years, taken the ground that the real fundamental chemical action of the furnace, was simultaneously between the silica, the oxygen and the sulphides. This entails the absorption of the oxide of iron as fast as it is formed; while the customary view, which looks upon the pyritic effects as a mixed process of roasting and scorifying, pre-supposes the existence at all times of a quantity of metallic oxide in the furnace awaiting its union with the silica. We never find this oxide when digging out the cooled contents of a furnace, nor is it probable that we would find it even if the furnace were to be instantaneously frozen up and stopped. Still every writer on the phenomena of pyritic smelting has apparently taken it for granted that this was the way it worked, and so far as I know I have made no converts to my views.

I do not assert that no production of oxides apart from silicates is known in the pyritic furnace. Mr. Austin noticed the formation of the magnetic oxide of iron in the neighborhood of the tuyeres—a phenomenon repeated in the copper converter, as reported by Herman Keller. It may also be that isolated fragments of sulphide, passing down next the walls, might become gradually roasted and converted into oxide whenever the conditions allowed it. Aside from exceptional occurrences I believe that no oxide of iron is formed other than that produced and absorbed through the interaction embodied in my equation (B). The matter has great practical as well as theoretical importance, and ought to be subjected to the scrutiny of all operators who are in position to test it. I should not consider it a compliment were my views to be accepted without careful investigation, to be airily incorporated into far-fetched and moonshiny theories made up, on the spur of the moment, to fit real or imaginary phenomena of smelting.

Mr. Thomas Reed (this JOURNAL, November 10, 1904) criticises with force and acuteness my definition of sulphide smelting as that process wherein metallic oxides are formed inside the furnace, but he weakens his cause by preferring the customary definition wherein the process is made to depend upon the heat of the burning sulphides. The objection to the latter definition is precisely the same in character as that urged against mine, in that other processes depend also upon this output of heat—kiln- and stall-roasting, for example. The real objection, however, lies deeper. The output of heat is not logically the foundation of the process; it is only an incident, a symptom, as it were. As well might a physician define a fever as the disease that produces a headache as we, overlooking the scientific basis of the process, insist upon heat-production as the fundamental fact of sulphide smelting. The less a man knows about it the more he insists upon this view. You will find sulphur held up as the source pre-eminently of the heat of the process, while in point of fact it generally furnishes the least important part. Heat is produced in this furnace in a variety of ways; by the burning of the iron; by the burning of the coke; by the burning of the sulphur; by the formation of silicates (slag); and finally it is brought in by the heated blast. None of these sources is indispensable in the sense that the process depends upon it, although in all these cases it is a necessary incident. I acknowledge the imperfection of my definition of the process, but who is going to afford a better one? Certainly not any long-range chemical enthusiast, ever ready with his theories to fit any case, real or imaginary, who may like to try his hand. We must have practical skill and a thorough knowledge of the actual workings of the process before we attempt to do justice to theoretical mat-

ters. Theoretical chemistry can teach us but little as to what actually goes on inside the stack. It is essential to interrogate the furnace itself; to study the meaning of every effect and every phenomenon that takes place; to weigh and analyze until a new fact is evolved, which we have then a right, since it is our fact and not another's, to develop into scientific symbols and explain as things may move us.

HERBERT LANG.

Oakland, Cal., Dec. 25, 1904.

CHLORINATION VS. CYANIDATION.

The Editor:

Sir—Mr. Greenawalt's criticism of my letter, published in your issue of November 24, would not call for a reply, had his quotations been correct or his assumptions founded on fact.

In an elaborate effort to write down the cyanide process, he stands confessedly guilty of giving the *total cost* of chlorination at $2.90 to $3 per ton, omitting nevertheless from said total cost such important and indispensable items as the capital invested in plant and that locked up in ore, stores and labor, as well as cost of administration, cyaniding tailing, taxes and insurance. As an excuse for these omissions he now claims that "such items of expense would be irrelevant and decidedly misleading." In alluding to the chlorination plants of the "mill combine" I distinctly stated "what the works actually cost to build I have no means of determining, but would estimate roughly that $1.50 per ton covers the interest on the bonds and the replacement of the works fifteen years hence." I had previously shown that the interest on the bonds amounted to a charge of about 70c. per ton of ore treated, leaving 80c. per ton to apply on amortization; but nothing for the stockholders. The nine-million-dollar assumed book value—not the actual value—of the mills, would on a 6 per cent earning basis call for $540,000 per annum, say $2 per ton of ore treated; this has nothing whatever to do with amortization, which was roughly figured at 10 per cent on each example given. For greater clearness I will now bring these items together in an endeavor to show the total cost of chlorination in the plants of the "mill combine," first taking Mr. Greenawalt's total cost: As operating cost, $3; interest on bonded debt, 250,000 tons at $0.72; general expenses of all kinds, legal and office salaries, advertising, taxes, etc., $176,052.99 on assumed tonnage above $0.70; cyaniding the tailing, $0.45; amortization, $0.80; total, $5.67. Part of the taxes, salaries, etc., are no doubt rightly chargeable to the smelter, how much I do not know; however, to be perfectly fair and at the same time safe, in the estimate of cost I will assume a total of $5 as the cost of chlorination in the plants of the "mill combine." This does not provide for any profits on the treatment; if we add 5 per cent earnings on the $9,864,600 preferred and common stock it would increase the cost to practically $7 per ton. I have stated, and am prepared to maintain, that the same grade ore can be cyanided for $2.20 per ton *total* cost, and when we consider that the "mill combine" is practically the only competitor a new cyanide plant would have to contend with, it must be conceded that a modern cyanide plant could easily hold the field against chlorination.

The 50c per ton allowed in Mr. Greenawalt's estimates covers only the ordinary repairs in a chlorination plant, as all experienced mill-men know. Lead-lined barrels, tanks, etc., are not only very expensive to instal, but also to maintain in operation. Neither steel, wood, stone, nor the human lung will long withstand the corrosive pungent fumes of chlorine; so assuming the mills in question do not become obsolete in a year or two, they will most assuredly require new "lock, stock and barrel" inside the 15 and 20 years, respectively, that I have given them.

PHILIP ARGALL.

Denver, Dec. 20, 1904.

Tyndall urged the scientific use of the imagination; he knew how to apply it.

The principle of chemical oxidation and reduction was worked out on the practical side by metallurgy long before it was pictured under the doctrine of 'phlogiston,' or defined by modern theory. In a word, phlogiston was the principle of chemical reducibility on the one hand; on the other, it was an unconscious anticipation of the quality of potential energy.

Wolframite is the only mineral used, as such, in the electric furnace. It is a tungstate of iron and manganese, of the formula $Fe^{II} WO_4$, where part of the iron—from one-fifth to three-fifths—is replaced by manganese. It fuses easily. Its specific gravity is above 7, and its hardness is above 5; but it is very brittle. Sometimes it is weakly magnetic.

WATER-POWER IN SWITZERLAND.—The little town of Davos, in the Swiss Alps, a noted health resort, has a fixed population of 3,000, and as many more as winter guests. According to the *American Electrician*, this is served entirely by electricity from two streams nearly 10 miles away, at a cost of 3.3 centimes ($0.0066) per kilowatt-hour. It comes a little high for cooking, but is reasonable for heating. Local physicians claim great advantage for the service. This is perhaps the first town in history to be lighted, heated and provided with cooking heat, by electricity. If many other cities should want to follow suit immediately, it would require an enormous expansion of copper production; but many will live to see it.

Geological Progress.

BY EDMUND OTIS HOVEY.

The seventeenth annual meeting of the Geological Society of America was held at the University of Pennsylvania, Philadelphia, December 29 to 31, 1904.

The address of Professor Branner, the retiring president, was upon 'Geological and Geographical Studies on the Northeast Coast of Brazil.' Among the 61 papers presented at the meeting there were some which are of interest to the mining fraternity. Professor James F. Kemp, of Columbia University, described and discussed the garnet contact zones and associated copper ores at San José, Tamaulipas, Mexico. He showed how a laccolith of andesite-porphyry had been intruded into Cretaceous limestone, producing extensive contact metamorphism. The oldest igneous rocks of the district are nepheline syenite and diabasic gabbro, while the latest is the andesite laccolith. The region has been intersected by a fault which is older than the laccolith. Many interesting dikes of tinguaite, analcite-tinguaite, diabase, camptonite and vogesite occur. The blue limestone of the unaltered beds gradually changes to the white marble of the contact zone. The first product of metamorphism is an occasional tremolite crystal in the blue limestone; then occurs the banded marble with quartz inclusions, while near the contact the metamorphosed rock is white marble with garnet (grossular and almandite), wollastonite and diopside. Magnetite is a later product. The garnet zone is, geologically speaking, the most important result of the metamorphism due to the laccolith. The chalcopyrite, which is the great source of copper at this mine, and the pyrite were formed at lower temperatures than the other contact minerals, and therefore belong to a late phase of the metamorphism. For the most part, the effects of the metamorphism have been the rearrangement and re-crystallization of old materials, not the addition of new materials, except as the water associated with the igneous magma has made its contributions. The garnet zone shows the mineral present from a mere sprinkling on the limestone to practically solid garnet, and the same is true of the wollastonite. No fluorite has been observed. The amount of metamorphism is unusual in connection with such a fine-grained and porphyritic rock.

In another communication Professor Kemp described his method of 'Geological Bookkeeping,' which is a system of taking notes in the field and of locating the observations upon the field map, based upon a series of definite and invariably subdivided squares. This leads to a compilation book in which the observations of scattered seasons are entered upon pages which correspond in their enumeration to the series of squares on the field map. It is believed that the system possesses advantages in affording permanency and in-

telligibility of records, even though the latter be made at widely diverse times and by different individuals.

Dr. E. H. Kraus, of the University of Michigan, read a paper on the occurrence and distribution of celestite-bearing rocks, in which he said in abstract: A study of the rocks—shales and dolomitic limestones—of the upper portion of the Salina epoch in Central New York shows that celestite occurs quite widely disseminated throughout them in the form of well-developed crystals and in small circular spots. The celestite was no doubt deposited simultaneously with the rock material. The rocks on the Island of Put-In Bay, Lake Erie, and in southern Michigan, particularly those at the Maybee quarry, Monroe county, show a similar occurrence of celestite. When the celestite-bearing rocks are leached by the action of circulating water the celestite passes quite readily into solution, and the rock then assumes a porous character. In this manner the so-called "vermicular limestones" of New York, and also the "gashed" and "acicular" dolomites of Michigan may be explained. Such celestite rocks are also the source of the large deposits of celestite on the islands of Lake Erie—especially Put-In Bay—and at the Maybee quarry, Monroe county, Mich.

In a paper discussing the origin of the caves of the Island of Put-In Bay, Lake Erie, Dr. Kraus brought forward some considerations which doubtless have a rather wide application. The rocks of Lower Helderberg age of this region are very much disturbed. A series of folds with the axes extending in a north-south direction, cross the island. The largest of the four caves open to the public is Perry's. The ceiling of this cave shows the folding very clearly, and also some interesting irregularities, in that not all the strata extend entirely across the cave. This gives the ceiling an appearance similar, to some extent, to an inverted flight of steps. The floor of the cave conforms to the unevenness of the ceiling, for where there is a depression in the former, there is a corresponding projection downward in the latter, and *vice versa*. This phenomenon is, no doubt, the result of folding and subsequent collapse. In all probability the folding was caused by the hydration of anhydrite, for large deposits of gypsum have been encountered in the sinking of wells in the immediate vicinity. Cores from these wells show a large amount of brecciation. Inasmuch as the increase in volume caused by the hydration of anhydrite may be as high as 60 per cent, and since there is a large supply of water present to bring about the solution of the gypsum thus formed—the level of the lake is reached at a depth of about 40 feet—we have given the probable causes for the folding, leaching and subsequent collapse.

Professor Frank D. Adams, of McGill University, presented the results of an investigation made by himself and Mr. E. G. Coker into the cubic compressibility of rocks, and certain phases of rock flow. The apparatus employed was an improvement of that which had been used by Professor Adams in some remarkable experiments, the results of which were published five years ago. In the present experiments nickel-steel tubes have been used and the compressibility of fourteen typical rocks determined, and the deformation of the rock-making minerals concerned were carefully studied by means of the microscope.

Professor W. G. Miller, of Toronto University, gave a paper describing and discussing the mineral origin of the pre-Cambrian era in the vicinity of Lake Temiskaming, Canada. Two areas of pre-Cambrian rocks in northwestern Ontario, those of the 'original Huronian' area on Lake Huron and of the Rainy River district, have been somewhat closely studied, and the reports on them have become almost classic. Lake Temiskaming, which is on the eastern boundary of the province, lies more than 200 miles east of the former area. Although numerous descriptions have been published of the crystalline rocks of the region lying between these two localities, little success has been achieved in subdividing and classifying them. A. E. Barlow's work of a year ago showed that there are two series in the vicinity of Lake Temagami, an older complex igneous group and a younger fragmental group, together with later intrusions.

During a part of the past summer Professor Miller was engaged in mapping an area of about 15 miles square which lies at the northwest corner of Lake Temiskaming, 25 miles north of Temagami. In this area he has discovered two unconformable fragmental series among the pre-Cambrian rocks. The oldest group here is similar to the older of the two groups at Temagami. It consists of a complex assemblage of igneous rocks which may be broadly divided into three varieties, although others are present. The oldest of the varieties can now be called a greenstone. It is cut by quartz-porphyry. The two have been subjected to folding and are cut by granite. After the granite eruption erosion had taken place, giving rise to conglomerate and finer-grained, slate-like varieties, there had been a second period of erosion, and deposited on the surfaces of the two older series there is a group, or series, of arkose and quartzite. Each of these three series, or groups, is cut by diabases and gabbros of pre-Palæozoic age.

The oldest of these series of Lake Temiskaming—the greenstone and quartz-porphyry with intruded granite—may, for the present at least, be correlated with the Thessalon greenstone, with associated granite, of the 'original Huronian,' and with a part of the Keewatin of the Rainy River district; while the second series, that of the conglomerates and slate-like rocks, corresponds, in this area, to the conglomerate of the Lower Huronian of Lake Huron. The arkose series of Temiskaming, which is unconformable to the conglomerate and slate, may here be considered to represent Logan's Upper Huronian of Lake Huron. More detailed work may, however, show that there are still other unconformities in the Temiskaming area. The second group or series—the conglomerate and slate, is of economic interest on account of the occurrence in it of ore deposits which, so far as is known, are unique on this continent. The ores are found in fissures which, in dip, approach the vertical, cutting through the usually slightly inclined conglomerates and slates. Ore is being shipped from four properties. The chief ores are native silver, smaltite and niccolite. Associated with these are native bismuth, erythrite, annabergite, chloanthite, millerite, argentite, dyscrasite, pyrargyrite, stephanite, tetrahedrite, graphite and other minerals. It will be noted that this association of minerals is similar to that of deposits which have long been worked in Germany.

The formation of the veins of so-called asbestos (fibrous serpentine) at the Thetford mines, Canada, and elsewhere, has been the subject of recent study by Dr. G. P. Merrill, of the National Museum, whose conclusions were presented to the society at this meeting. The country rock at the Thetford mines is a massive, dark-green serpentine, resulting from alteration of a highly basic igneous rock (peridotyte). The asbestos occurs in the veins which intersect one another for the most part at right angles, but there are abrupt changes in the character of the veins, and there are many interruptions of their continuity. Dr. Merrill suggests that the original cavities were due to shrinkage, and that the filling process has been carried on from the walls inward. Along the joint planes there has been much movement, due to increase in the mass resulting from the serpentinization of the peridotyte. Some of the veins show colloidal serpentine in the middle, which has been pushed along by the crystallizing process. Crumbling occurs in the fibers of some veins.

Many of the elements were known to exist in their salts and compounds, long before they were isolated. This was true of the metals of the alkaline and the alkaline-earth groups; but perhaps the most pronounced example is fluorine, which was not isolated in satisfactory condition till 1886. Moissan obtained it by electrolizing strongly cooled hydrofluoric acid; later HKF_2 was used as a source. The activity of free fluorine is remarkable, and all the more surprising is the slight ionization of the fluorides in water solution. There is still an enormous amount of promising work to be done on this element, the most acidiferous oxidizer known to chemistry.

Mining Stocks.

(Full quotations on pages 102 and 103.)

ew York Jan. 11.

Momentarily the stock market is drifting, encouraging the bears to attack prices and divide fractional profits. The volume of trading is not indicative of any unusual outside buying; in fact, it suggests a systematic attempt to keep quotations pivoted at a margin where the least speculation will be felt. Thus Amalgamated Copper has hovered above $72, and at one time touched $75, only to slip off later to $73, on transactions that look small compared to the period when the Boston operator waved the crimson flag. Anaconda did a little business between $22 and $27.50. Tennessee ruled lower at $37.75 to $32½. Greene Consolidated was uninteresting at $25.875@$26.125. British Columbia appeared at $6.375@$6.625.

Some interest was shown in United States Steel shares at $29.375@$30 for the common, and $92.50@$93 for the preferred. Another lot of 25,000 7% preferred shares is to be offered to employees at $87.50 per share, which is $22.50 higher than the previous sale. Some 81,000 preferred shares are already held by employees under the profit-sharing plan.

The shares of the American Smelting & Refining Co. were in fair demand, the common selling at $80.50@$81.625, and the preferred at $113. Federal Mining & Smelting preferred stock moved at $75.75, but sales were small.

A sale of Ontario silver, of Utah, put the price at $4. Better trading is noted in the Cripple Creek gold shares, Portland standing at $1.75@$1.85, Vindicator Consolidated at 80c., Elkton at 70c., and Isabella at 28@29c. More interest has also been shown in the Comstock stocks, initiated probably by the rise in the price of Ophir to $7.25.

The New York Stock Exchange has stricken from its list the capital stock of $1,500,000 of the American Coal Co., because the charter, taken out in Maryland, expired by limitation on Dec. 31, 1904. A new charter, under the laws of New Jersey, has been applied for, and when granted, the company's stock will be re-listed. To date dividends amounting to $1,557,500 have been paid by the company on its $1,500,000 capitalization.

Colorado Springs. Jan. 6.

Cripple Creek mining shares have been in good demand during the past week, and have advanced considerably in price in some cases, with several stocks passing former records. Findley has declared a $12,500 dividend and expects to continue this dividend each month. Gold Sovereign has declared a 0.5c. dividend to stockholders.

The year 1904 closed one of the most prosperous years in the history of the camp. Since labor troubles have been settled the camp has gone ahead wonderfully and December made the remarkable production record of $2,262,000, the greatest in years. This brings the year's total production up to $22,422,680, but the past four months the camp has been producing at the rate of over $25,000,000 per year. The leasing system has been extended to beyond that of any previous years and the camp is being more thoroughly prospected and its boundaries being widened more rapidly than ever before. What have been supposed to be non-producing regions have been brought within the producing area, and thus opening up new sections to prospectors.

During the week El Paso has advanced from $1.16 to $1.23½. Elkton is selling around 69c.; Isabella at 27½c.; Vindicator at 80c. Work sold up to 13, but dropped off at 12⅝c. C. K. & N. sold at 23; Findley at 32½c.; Anaconda at 13c.; Gold Sovereign at 9⅜c. per share.

Salt Lake City. Jan. 7.

The sales of the week on the Salt Lake Stock & Mining Exchange aggregate $41,661, and the market closed with a number of traders showing an advance. May Day and New York were in brisk demand and interest was centered largely upon them. The latter ended several points higher, while New York sold at 50c. a share, afterwards weakening. Daly-West, influenced by the Eastern market, made some gains. Consolidated Mercur stiffened slightly, but the transactions were confined to the sale of 600 shares. Brokers call for Tetro again this week, and the stock sold up to 21, the highest point reached in several weeks. Daly-Judge continues to hold steady around $5 a share, with very little stock being offered. The directors of the Uncle Sam Consolidated have decided to pass the next regular dividend and apply the money to development. The Columbus Consolidated has levied an assessment of 20c. a share, which will be used in the liquidation of the company's indebtedness of about $50,000.

San Francisco. Jan. 5.

Business in the Comstock shares opened briskly after the holidays, and prices have generally risen. Ophir sold up to $7.25, but receded to $7. Mexican sold at $2.15; Consolidated California & Virginia, $2.05; Hale & Norcross, $1.40; Best & Belcher, $1.25; Sierra Nevada, 65c.; Chollar, 42c. per share.

On the San Francisco & Tonopah exchange, the trading was less active, but prices were firm. Tonopah, of Nevada, brought $10.50; Montana Tonopah, $1.95; Tonopah Belmont, 70c. per share.

On the California exchange, dealing in oil stocks was slow. The chief sales were of Oil City, at 69c.; and Independence, at 29c. per share.

Monterey. Dec. 29.

Though the price of silver has fluctuated considerably for several weeks, exchange on New York has remained steady at 202.125. Mining stocks have been quiet, and the few sales reported were Dos Estrellas, $3,700; Bessie, $10; Providencia, San Felipe, Guanajuato, $161; Barreno, San Luis Potosi, $100; La Paz, Matehuala, San Luis Potosi, $232; La Roma, $8; Nolan, $100; San Rafael, assessable, $740, non-assessable, $2,010; Santa Gertrudis, $68.50; Soledad, $1,320.

Notwithstanding that exchange on New York has been for some weeks between 202 and 202.50, the Mexican government announces that the duties on imports will be levied during January at the rate of 220, as has prevailed for the several months since exchange dropped below that figure. It, however, will pay for gold at the mints during the current month at the average exchange for December, 202.84, which makes a kilo of gold worth $1,307.01 in Mexican money, the parity value of a kilo of gold being taken at $675.416.

Coal Trade Review.

New York, Jan. 11.

ANTHRACITE.

The trade in hard coal remains without special features. The fluctuations in the weather are almost immediately reflected in the size of northern shipments, but no conditions have yet affected the normal price at which both domestic and steam sizes have been maintained since September. These are, at New York Harbor points: Domestic, $4.75 for broken, and $5 for egg, stove and chestnut; steam sizes, about $3 for pea coal, $2.25@$2.50 for buckwheat, $1.45@$1.50 for rice, and $1.30@$1.35 for barley.

In Manhattan the condition of the streets is better, which makes house delivery easy, so that local dealers are deriving full advantage from the continued cold weather.

During the quietness of the holidays the railroads were able to overcome part of their traffic congestion, and are now in better shape to handle the somewhat urgent demands of local dealers.

In New England the all-rail routes are working more smoothly, although the shortage of cars still continues. The producing roads are allowing a somewhat greater proportion of all-rail shipments into this territory, with the result that the Sound ports are finding relief from their crowded condition of the past few weeks.

BITUMINOUS.

The Atlantic seaboard soft coal trade is active. Supply of coal is somewhat better than it has been of late, and prices are lower. Steam coal can be purchased at $2.87@$2.90 per ton f. o. b. New York harbor shipping ports. New season business has not yet developed. Soon the question of labor at the mines will receive attention.

Trade in the far East is good, and requests indicate that, notwithstanding the large tonnage that has arrived and been discharged, the inadequate water supply for power is still inconveniencing manufacturers.

Along the Sound business is active, and the demand exceeds the quota usually allotted to that territory. At New York harbor the improved supply of coal has influenced market prices. All-rail trade is very good. The embargo at all-rail and New England ports is still in force.

The coastwise market shows a scarcity of vessels, but as the demand is not urgent rates remain steady. From Philadelphia the rate to Boston, Salem and Portland is 80c.; to the Sound, 65c., and to Portsmouth, 90c. per ton.

Birmingham. Jan. 9.

The coal production in Alabama is heavy, though the strike of the union coal miners is still on. A large number of non-union men are still being brought into the district, and while the men are novices to a great extent in mining, many are learning the work fast and the production at the furnace companies' mines is improving. At non-union and commercial coal mines a great output is reported and there is demand for every ton of coal that can be supplied. Good prices prevail. All miners and mine workers, union and non-union, are now getting the maximum wage in Alabama, 57½c. per ton. The iron sales-books of the various iron companies were recently investigated and the average selling price of the product found

to warrant an advance in the coal mining wage. The leaders of the union miners claim that they are in position to keep up the strike for an indefinite period and this month cut in half the assessment on the men working in the commercial coal mines under temporary contracts; $1 per week was collected from each man at work for the strike fund heretofore. This has been reduced to 50c. per week per man.

The Republic Iron & Steel Co. has 100 new coke ovens at Warner mines completed. The Tennessee Coal, Iron & Railroad Co. has a number of ovens ready also to be started up in the next few days. The Tutweiler Coal, Iron & Railway Co. the past few days let a contract for the construction of a number of new coke ovens at Vanderbilt.

Chief State Mine Inspector J. M. Gray has sent in his report to the governor as to the fatal accidents in the Alabama coal mines during the year 1904. There were 86 men killed in the mines last year as against 57 in 1903.

Rumors prevail that the properties of the Pratt Coal Co., the Globe Coal Co. and other commercial coal companies in this district will shortly be consolidated into one company, headed by G. B. McCormack, Erskine Ramsey, T. T. Hillman and others. The company will be the largest coal concern in the South. Recently these parties purchased coal lands in Walker county and elsewhere and have prospects for further purchases.

The Wolf Creek Coal Company has been organized with $250,000 capital stock. The company owns a large tract of coal land near Carbon Hill and Corona in Walker county.

Cleveland. Jan. 10.

The coal trade seems to be a little in the dumps at the present time. Cleveland is filled with coal and without buyers. The prices on steam coal have gone off some and the market is weaker. Run-of-mine coal of the Pittsburg and Ohio territories is selling at $1 at the mines, which is a drop of 5c. or 10c. within the past few days. There is something touching an overproduction to account for the condition of coal in this territory. The consumption has not lessened in any material way, and therefore the only explanation for the abundance is that the mines are producing too freely. The slack situation, on the contrary, is strong. The market is feeling the effects of the lessening of the supply due to the shutting down of the lake trade and the movement in that direction of the ¾-in. coal, which makes the summer abundance of slack. The prices are stiff. Pittsburg slack is bringing 70c.@75c., on contract and 75c. on spot delivery. Most of the contracting has been done, so the higher price rules. Ohio slack is bringing 70c. at the mines. The demand is strong.

The coke situation is really the future of the fuel market. The ovens in the Connellesville district, are finding themselves a good deal behind their orders and, with their current run of business, it is not easy to catch up, to say nothing of meeting the increased demand. The relief from the drought did not bring about the easier market which might reasonably have been expected, and the prices have stiffened. The best grade of foundry coke, which is now in excellent demand from all quarters, is bringing $3.25 for spot shipment with contracts being taken at $3@$3.25. The best grade of furnace coke is selling at $3 at the oven, with contracts placed on the basis of $2.75@$3 at the oven.

Pittsburg. Jan. 10.

Coal.—Coal shipments to lower ports are ended for the present. The stormy weather prevented the shipment of all the coal ready to go out, and the total tonnage sent down the river will not exceed 10,000,000 bush. It is reported today that some of the large tows are frozen up near Louisville. The car supply so far this week is fairly good, and most of the railroad mines in the district are working. Along the Pennsylvania railroad nearly all the mines are closed on account of the snow. Prices are a little firmer, and run-of-mine coal is quoted this week at $1.10 a ton at the mine.

Connellsville Coke.—Production continues to increase and prices are firmer. Furnace coke is quoted at $2.75@$3 for prompt shipment, and contracts for delivery through the first half are being made at $2.50@$2.75. Foundry coke is quoted at $3@$3.25. Over 1,000 idle ovens were put in operation recently, and the shutdown throughout the region for Christmas and New Years did not decrease the production from the last report made. The production for the week was 228,612 tons. The shipments amounted to 8,983 cars, distributed as follows: To Pittsburg and river points, 3,508 cars; to points west of Pittsburg, 4,455 cars; to points east of Everson, 1,020 cars. This was a decrease of 396 cars compared with the previous week.

The total production and shipments for December were very satisfactory compared with the balance of the last quarter. The total production and shipments for the four quarters of the last year were as follows, the figures being in tons:

	Production.	Shipments.
First quarter	2,548,837	2,438,174
Second quarter	2,656,127	2,465,901
Third quarter	2,323,838	2,334,461
Fourth quarter	2,698,307	2,664,697
Totals	10,227,109	9,903,233

Following is a comparison of the yearly production, in tons, for the last five years:

1900	10,207,524
1901	12,004,056
1902	12,726,550
1903	11,073,311
1904	10,227,109

From this it will be seen that production for 1904 was 846,202 tons less than that of 1903, and much less than that of any year since 1900.

San Francisco. Jan. 5.

The local coal market continues quiet, but steady, with no change in prices. A statement of imports for the full year 1904 will be found below.

For Pacific coast coals, in large lots to dealers, quotations are: Wellington and New Wellington, $8; Richmond, $7.50; Roslyn, $7; Seattle and Bryant, $6.50; Beaver Hill and Coos Bay, $5.50; white ash, $5.25. For Rocky Mountain coals, also in large lots to dealers, prices named are $8.50 for Castle Gate, Clear Creek, Rock Springs and Sunnyside; Colorado anthracite brings $4. For Eastern coal, quotations are largely nominal, supplies being light. Pennsylvania anthracite is $14 and Cumberland $13. For English coal, quotations are, ex-ship; Welsh anthracite, $13; cannel, $8.50; Wallsend and Brymbo, $7.50 per ton.

Mr. J. W. Harrison, of San Francisco, issues the following yearly circular, under date of December 31: "The total amount of coal imported into California this year, 1,051,072 tons, being 164,482 tons less than last year, would intimate that our manufacturing interests are declining, when the quantity of coal fuel is diminishing, but such is not the case. For example, the output of oil for the year will foot up nearly ten millions of barrels in excess of 1903, the major portion of which has been used by railway companies and industrial interests, showing by actual computation that our local manufacturers have largely increased their business, and a great many new industries are being introduced, being encouraged to do so by the low prices of fuel oil. At the beginning of this year (January 15), the duty of 67c. per ton on foreign coal was replaced, being an impediment to the success of steam consumers generally. The needs of the Treasury Department are not so urgent that the acquisition of the small amount of duties would be of much avail, yet at least 20% of the original coal cost at point of shipment is demanded by the government, and proves very onerous to the consumer.

"With fuel oil as a competitor, and the present reduced values set on same, coal has to be sold at comparatively low figures, when used for steam purposes; when utilized for domestic purposes a fair value is set upon it, as oil ceases to compete as a house fuel, until the principal obstacles are overcome, viz: the elimination of smell and smoke, and the increase of danger. There has been a pronounced decrease of Australian coal imports this year, caused mainly by coal carriers being unable to find profitable employment on arrival here, and present conditions are now compelling a large number of vessels to return to the colonies in ballast. This naturally forces shippers to pay generous freight rates on coal from Newcastle, N. S. W., and causes a marked shrinkage of amount delivered. Ruling prices have been very uniform during the year, and consumers cannot complain of paying extreme rates, as the profits are very meager when the cost of handling same is considered.

"The various sources from which we have derived our coal supplies are as follows:

	1903. Tons.	1904. Tons.
British Columbia	289,890	335,137
Australia	276,186	148,409
English and Welsh	61,580	64,664
Scotch	3,495	1,666
Eastern (Cumberland and Anthracite)	13,262	29,055
Seattle (Washington)	127,819	139,063
Tacoma (Washington)	256,826	182,313
Mount Diablo, Coos Bay and Tesla	84,277	96,520
Japan and Rocky Mountain by rail	102,219	54,245
Total	1,215,554	1,051,072

"To secure a complete statement of the entire coal consumption of California, I have been obliged to include deliveries at Ports Los Angeles and San Diego by water, which have been added in the above sources of supply. The total amount received by water at those ports foot up 99,528 tons.

"The oil products for 1904 will aggregate fully 30,000,000 bbl., against 21,000,000 for 1903, and 13,000,000 for 1902. This immense increase shows the present status of our State for oil as a fuel producer, and its standing as a formidable competitor to coal locally. About three millions of barrels have been used for illuminating, lubricating, etc., and about 500,000 barrels of crude oil on roads. About ten million barrels are now in tankage, being held in reserve, evidencing that our future requirements are generally provided for. The present condition of the fuel situation for the demands of our factories is a most gratifying one, and promises generous profits for the coming year, as the asking

prices for oil are most favorable, with every likelihood of a sustenance of present values.

"The total deliveries of coke here by water aggregate 57,991 tons, as against 68,090 tons last year; fully 75 per cent of this amount was shipped from England, Germany and Belgium.

"Pig iron importations foot up 24,745 tons; this is about 5,000 tons less than in 1903. Prices have favored the buyers, as low quotations have ruled during the year.

"Business generally this year has been fairly prosperous, and the seasonable rainfall to date, and the general outlook at present, indicates increased prospects for 1905 in all lines. If promises are realized, we have favorable conditions awaiting us."

Foreign Coal Trade. Jan. 11.

There is little new in export trade here. A somewhat better demand for the West Indies is reported.

Messrs. Hull, Blyth & Co., of London and Cardiff, report, under date of December 31 that demand for all qualities is firmer, and a general rise in January may be expected. Quotations are: Best Welsh steam coal, $3.48; seconds, $3.36; thirds, $3.12; dry coals, $3.18; best Monmouthshire, $3.06; seconds, $3; best small steam coal, $1.98; seconds, $1.80; other sorts, $1.68.

The above prices for Cardiff coal are all f. o. b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f. o. b. Newport, both exclusive of wharfage, but inclusive of export duty, and are for cash in 30 days, less 2½% discount.

In the freight market, Mediterranean is a little firmer; other directions are weak with little demand. Some rates quoted from Cardiff are: Marseilles, $1.40; Genoa, $1.50; Naples, $1.38; Las Palmas, $1.26; St. Vincent, $1.44; Rio, $1.98; Santos, $2.52; Beunos Ayres, $1.62.

Iron Trade Review. Jan. 11.

The year opens, as might be expected, with a period of comparative quiet. In the December rush, manufacturers very largely filled their requirements for the first quarter of the year, and the mills were sufficiently supplied with orders to keep them running well through that period on an active basis, so that it is not at all surprising that there has been a cessation of new orders. People generally are looking around, and making sure of their ground. It is quite likely that we may see this time of waiting last for several weeks especially as many buyers are beginning to complain that prices are going too high; while, on the other hand, sellers consider it judicious to wait and see if they cannot exact a little more, when conditions of demand and supply come to be fully appreciated. This is the old contest; but for the present advantage seems to be on the sellers' side. In pig iron the only heavy buying for the present is by the cast-iron pipe makers, who seem to have accumulated heavy orders through the placing of some large contracts for municipalities, and the gathering in of some good foreign orders. While other purchases of pig iron are not heavy, it is understood that the United States Steel Corporation is not only putting more furnaces in blast, but is also calling in some of the options for iron which it has taken from independent furnaces. This looks as though the managers were assured of a heavy demand for some time to come.

In finished material the condition is much the same. New orders are slow just at present, but the mills are full of business, running over the first quarter, and well into the second, and do not seem to be disturbed about the future. The larger business doing at present is in bars and plates. The future of structural steel seems to be still a little uncertain, much depending on the course of matters in the building trades, especially with regard to labor.

In export trade very little is said for publication, but it is reported that there are negotiations pending for somewhat heavy business. A special rumor is that the Steel Corporation has an order for 100,000 tons of ship-plates for Harland & Wolff, of Belfast, Ireland. There seems to be little doubt of the fact of the orders, but it is impossible to ascertain anything positively as to prices. Report, however, puts them at about 50 per cent below the quotations now given for home deliveries.

Birmingham. Jan. 8.

There is much strength to the Alabama pig iron market and the future prospects are bright. There is not a great amount of iron being produced right now, in fact, the make is 30% less than what it was this time last year. There is still a shortage of coke and other supplies, occasioned by the strike.

The shipments in this district are equal to the production. There are many orders in hand for the product. There is some denial to the statement that a great quantity of iron is being held for better prices in Alabama. Railroad officials assert that a request for cars with which to handle iron was recently filled and that the iron was not on hand for immediate loading. It is believed that quotations will go up 50c. on the ton within the next ten days. Local consumers cannot buy now under $14 per ton for No. 2 foundry. Consumers outside of the district are paying $13.75 per ton at the furnaces here right along.

The following quotations are given: No. 1 foundry, $14@$14.25; No. 2 foundry, $13.75@$14; No. 3 foundry, $13@$13.50, No. 4 foundry, $12.75@$13; gray forge, $12.50; No. 1 soft, $14@$14.25; No. 2 soft, $13.75@$14.

The steel trade conditions are active. At the Tennessee Coal, Iron & Railroad Co.'s plant at Ensley there is no hesitation in the steel production, the rail production in particular being heavy. The company is accepting business carefully, on account of the many orders on hand and those in sight. The Tennessee Co. has a large force of men at work at their steel plant putting in the improvements which were mentioned some weeks ago. More than $200,000 will be expended in a new melting furnace and other improvements. It is expected that when the present plans are carried out the output of the plant will be increased 50%.

There is a fairly good demand for finished iron and steel, and the several rolling mills in this section are doing as well as at any time in the past six months.

Col. T. G. Bush, Morris Bush, G. B. McCormack, Erskine Ramsey and other associates have formed the Coosa Pipe Co. and will erect a soil-pipe plant at Gadsden. The concern is capitalized at $50,000, and a plant will be erected at once capable of melting 10,000 tons of pig iron per annum. The plant will be independent, and it is expected that the demand will be such as to warrant an enlargement of the plant within a few months.

Cleveland. Jan. 10.

Iron Ore.—The market for iron ore is very quiet. The approach of the time when shipments down the lakes are usually planned for the ensuing season has seen no stir among the shippers or the vessel owners. There are a few inquiries for ore, but they have produced only a few small sales. These have gone of late at prices about 75c. a ton above the quotations which ruled on the shipments made last year. The movement from the lake docks to the furnace stock-piles is not expected at this time of the year, and the market is, in consequence, without much importance.

Pig Iron.—About all of the buyers of any importance have covered their needs for iron for the present quarter, and are in no rush to buy for the ensuing three months, especially as many of the furnaces are holding for prices which the consumers do not believeis warranted. The other furnaces are not willing to sell just now for the second quarter delivery. The market is pretty tame, with a few sales of foundry at $16.50@$17 in the Valley for No. 2. This is obtained on all sales for spot delivery and on the majority of sales made for second quarter delivery. The southern furnaces are out of this market for the time being. Their supply is sold up for the present, but the few having material for sale are asking $14, Birmingham, which is equivalent to $17.85 Cleveland and therefore out of the question with Northern iron to be had at $1 lower. There have been no sales reported of bessemer and the basic trade is dull.

Finished Material.—There are but two interesting features to the finished material trade, and in both om them prices show a striking tendency to advance. In the other trades it is the same old story of moderate buying, but good specifications against former contracts and evidences of heavy consumption. The two features are light rails and billets. The billet market is exceptionally strong. The association price is $21, Pittsburg, for the standard bessemer billets, but during the past few days both bessemer and open-hearth billets have sold in small lots in Cleveland as high as $30, which is $7 above the regular association price. Premiums of $4 a ton are regularly demanded and these are paid by those who need the material.

The mills are not offering material, but are taking what orders come to them, being well supplied with all the business they care to handle. The other strong feature of the market is light rails. The demand is exceptionally heavy and the market is steady. The best the mills can offer to do is to make deliveries in six to eight weeks. In structural and plates there is a fair demand on the mills can offer to do is to make deliveries in six to eight weeks. In structural and plates there is a fair demantl on new orders and good specification against old contracts. The mills are not urging sales, since they have about all the business they care to handle. There is a prospect ahead for some good rail contracts with traction companies, but they have not appeared on the market. The sheet trade is moderate with good buying at 2.40c. for Nos. 22-24 out of stock and 2.10c. for the same gauges in car lots at the mill. Bar iron being influenced by the price of scrap, is holding at 1.65 to 1.70c. Youngstown, while bar steel both Bessemer and open-hearth, is quoted at 1.40c. Pittsburg.

New York. Jan. 11.

Pig Iron.—Business since Jan. 1 has been a little quiet, but this was to be expected at this season. The principal demand just at present is coming from the cast-iron pipe companies. Some large contracts for pipe have been placed, and it is said that over 100,000 tons of iron will be needed for this purpose. Prices are firm, and generally a little higher all around.

For Northern iron, large lots, New York delivery, we quote as follows: No. 1X foundry, $17.75; No. 2X, $17.50; No. 2 plain, $16.75; gray forge, $16.50. Some Virginia basic has been sold at $17.65, the highest price yet reported.

Southern iron seems to be held firmly on the basis of $14 Birmingham for No. 2 foundry. We quote for large lots on dock: No. 1 foundry, $17.75; No. 2 foundry, $17.75; No. 2 foundry, $17.25@$17.50; No. 3 foundry, $16.75; No. 4 foundry, $16.25; No. 1 soft, $17.75; No. 2 soft, $17.25; gray forge, $16.25.

In pig iron warrants on the Produce Exchange business has been rather dull, and only small sales are reported. The latest quotations are as follows, the first price named being the bid, the second the asked figure: January, $16.90@$17.10; February, $16.70@$17.15; March, $17@$17.15; April, $17@$17.25; May, $17@$17.15; April, $17@$17.25; May, $17@$17.30; June, $16.90@$17.20.

Bars.—The market continues strong, and demand is very good. Both iron and soft steel bars are quoted at 1.645c. for large lots, tidewater delivery. Store trade is active, with quotations 2@2.10c. for small lots.

Plates.—Buying has been rather slow, but prices are firm, and tank plates, ¼ in., are quoted at 1.645c. in large lots to tidewater. Flange plates are 1.745c. and boiler plates 1.845c., same delivery.

Structural Material.—Not much new business is reported, but deliveries are being urged under contracts to a greater extent than heretofore. Beams and channels up to 15 in. are quoted at 1.645c. for large lots, and over 15 in., 1.745c. Angles are 1.645c. in large lots.

Steel Rails.—The regular quotation continues $28 per ton at mill for standard sections. Light rails are in good demand, and are somewhat higher, prices ranging from $23 for 35-lb. sections, up to $28 for 12-lb. sections.

Scrap.—Old material continues in good demand, and the yards find it difficult to get supplies. Machinery cast is quoted at $13@$14 per ton, according to quality. No. 1 wrought has sold as high as $18.50@$19. Heavy steel melting scrap brings around $16.50. These prices are on cars, Jersey City, or other terminal deliveries. Scrap delivered brings from $1@$1.50 per ton more.

Pittsburg. Jan. 10.

The iron market so far this year has been very quiet, but indications point to a very active trade before the end of the week. A well-informed manufacturer declared to-day that, while business has been dull since the opening of the new year, he expects a heavy buying movement will be started within the next few days. The orders for steel on the books of the United States Steel Corporation concerns and independent companies are reported to be enormous. That the corporation mills are crowded with business is indicated by its big demand for pig iron. All of its furnaces in the Pittsburg district are in operation, and one of the Dinora furnaces, which might be included in this district, was put in blast last week; the other one will be started this week. These are new furnaces and never have been operated. Another indication of the Corporation's requirements for iron is the fact that the two old furnaces at Columbus, that it was thought would never be put in blast again, are now in full operation. There are 41 blast furnaces in the Pittsburg district, not counting the two at Dinora, and all are in operation. There were several accidents at some of them, but repairs were quickly made. It has just developed that of the December iron bought by the Corporation from the Valley furnaces, from 5,000 to 10,000 tons remains undelivered. The contracts could be cancelled, but instead agents are in the Valleys urging shipment. It is reported, and the report is generally credited, that the Corporation is looking for bessemer iron for January shipment. The fact that it cannot make enough iron for its own use is regarded as positive proof that it has an unusually large number of orders for finished steel products on its books. There was a rumor about six months ago that the Corporation had captured a big plate order in Ireland, but nothing definite was developed regarding the order. It is now reported, and there seems to be some grounds for the report, that the corporation has sold to Harland & Wolff, shipbuilders, of Belfast, Ireland, 100,000 tons of tank plate. or ship plate, as it is called over there, at $23 a ton. The terms are not indicated in the report, and the price may be based on a long ton at the mill, which would be equal to about 1c. a pound, while the pool price is 1.5c. Or, if the $23 price is correct and the delivered price, it may be for a short ton of 2,000 lb., instead of 2,240 lb., and at 1c. a lb. would leave $3 a ton for freight, a very low rate. No confirmation of the report can be obtained from the Corporation, but steel men here seem inclined to believe that a large tonnage has been booked. All the plate mills are being operated to their full capacity, but it is known that a heavy tonnage is going into steel car-building, as all the steel car concerns have orders that will keep their plants busy into the second half of the year. The demand for structural steel also is unusually heavy. The fact that the constructing concerns in this district have large and profitable contracts was shown last week, when prompt settlements were made with the workmen. The Pittsburg Erectors' Association, which is composed of the American Bridge Co., the Riter-Conley Construction Co., the McClintic-Marshall Construction Co. and about a dozen other large concerns withdrew demands made at a wage conference with the International Association of Bridge & Structural Ironworkers. The workers made but one concession, which permits the employees one apprentice to every four skilled workmen, instead of one for every seven. Immediately after this settlement the Erectors' Association met representatives of the International Union of Steam Engineers and made a settlement at last year's wages and conditions which were demanded by the men. These settlements will prevent any labor troubles this year in the steel construction line. All the mills in the district are busy, and for the first time in a long while the men at the Rankin works of the American Steel & Wire Co. were required to work on Sunday. Every important line of iron and steel finished products have been advanced within the past three weeks except wire and wire nails, and an increase is expected to be announced this week. Several advances have been made in wire products, but they were not sufficient to offset the heavy cut made last August. Bar iron prices have advanced, and the Republic Iron & Steel Co. is quoting 1.65c., Youngstown, for common iron bars, which is equivalent to 1.69¾c., Pittsburg. The bimonthly adjustment of wages under the sliding scale of the Amalgamated Association of Iron, Steel & Tin Workers is being made to-day at Youngstown. The wages for January and February are based on the average sales of November and December, and it is not likely there will be an advance, as the sales made during the last two months were at former prices, which will not average 1.4c., which price is necessary to give the workmen an advance. It is believed that at the March bimonthly adjustment the sales sheets will show an average of 1.6c., which will increase the wages of the puddlers from $4.90 to $5.62½ a ton.

Pig Iron.—The market is quiet, but prices are firm. Most of the furnaces are sold up for the first quarter. Ruling prices are as follows: Bessemer and basic, $16, Valley furnace; foundry No. 2, $17.10@$17.60, Pittsburg; gray forge, $16.35@$16.60, Pittsburg. Southern foundry No. 2 is quoted here at $18.10@$18.35, or $13.75@$14, Birmingham. J. G. Butler, Jr., chairman of the Bessemer Pig Iron Association, issued his monthly report to-day. It is as follows: "Of 191 furnaces, users of Lake Superior ore, 158 were in blast January 1, 1905, with a daily capacity of 48,718 tons; 33 stacks were out of commission, with a daily capacity of 8,096 tons. The capacity in active operation was 86 per cent, a gain of 51 per cent for the year, and since December 1 there has been an increase of 8 per cent."

Steel.—Billets and sheet bars cannot be obtained at the pool price, and premiums of from $2 to $3 a ton are offered. Most of the consumers are covered on sliding-scale contracts, or purchases made before prices were advanced. Merchant steel bars are firm at 1.40c., and plates are quoted at 1.50c.

Sheets.—But little new business is being placed, many consumers being well covered for this month. Prices remain firm at 2.30c. for No. 28 gauge black sheets, and 3.35c. for galvanized sheets.

Ferro-Manganese.—The market is fairly good, and 80 per cent domestic is still quoted at $43@$45 a ton.

Cartagena, Spain. Dec. 25.

Iron and Manganiferous Ores.—Messrs. Barrington & Holt report that shipments for the week were one cargo, 3,500 tons dry ore, to Great Britain. Several large orders have been refused by sellers for 1905 delivery at same prices as paid early in the month. Prices especially for dry iron ore may be considered as sound and strong with a steady up grade tendency.

Quotations for iron ores are as follows: Ordinary 50% ore, 6s.@6s. 3d.; special low phosphorus, 6s. 6d.@7s. 3d.; specular ore, 58% iron, 8s. 9d.; magnetic ore, 60%, 10s. 9d. for lumps and 9s. for smalls. For manganiferous ores quotations vary from 9s. 6d. for 12% manganese and 35% iron, up to 14s. 3d. for 20% manganese and 20% iron.

Pyrite.—Iron pyrite, 40% iron and 43% sulphur, is quoted at 10s. per ton. No shipments for the week. There were 14 tons copper pyrite shipped to Swansea.

Chemicals and Minerals.

(See also Prices Current, page 120.)

New York, Jan. 11.

The market generally presents a more cheerful appearance; prices are improving, and with an expansion in consumption, there should be a better balance sheet at the end of 1905. Contracts are being booked by paris green makers at an advance of 1c. per lb. on last year's schedule; but even at the new quotation of 12c. per lb., the profit is limited by the higher market for raw material. Mineral pigments are very quiet, and in French ocher the future market has been shaken by renewed competition. The ocher trade is awaiting development in the new India deposits, samples of which have been imported into Great Britain. Reports give the content of ferric oxide in the finer grade of India ocher at as high as 49%, but it is probable that the large quantity to be marketed in future will analyze less. Evidently the mineral resources in India are extensive, and as in the case of manganese ore and magnesite, their development will depend on economic transportation. Considerable quantities of India mica are exported to London for distribution in the world's markets; why should not other minerals be handled in the same way?

The interesting topic is the news that the French government has taxed the cargo of sulphur sent to Marseilles. This was the initial export of American sulphur, and being of first class quality made a favorable impression among European consumers who had been accustomed to buy Sicilian exclusively.

Copper Sulphate.—The market continues firm at $5.125@$5.25 per 100 pounds.

Acids.—Little doing outside of sulphuric acid for forward shipment. Quotations are:

Nitric acid, 36°, 100 lb.	$5.00
38°, 100 lb.	5.25
40°, 100 lb.	5.50
42°, 100 lb.	5.75
Oxalic acid, com'l, 100 lb.	5.00@5.375
Sulphuric acid, 50°, bulk, ton	13.50@14.50
60°, 100 lb. in carboys	1.05
60°, bulk ton	18.00@20.00
66°, 100 lb. in carboys	1.20
66°, bulk ton	21.00@23.00

Bleaching Powder.—Quiet. Contract prices are $1.20@$1.25 per 100 lb. for prime brands.

Sulphur and Pyrite.—Evidently the Sicilian combination is determined to check American exports of sulphur, for it has induced the French government to tax the 3,000 tons sent to Marseilles in October, 1904. France consumes annually over 95,000 tons Sicilian sulphur, worth in Marseilles from $18.90@$20.80 per ton, and used mostly as an insecticide in the vineyards. The French import duty on pulverized, purified, refined or flowers of sulphur, is equivalent to $5.79 per ton under the general tariff, and $4.34 as a minimum, while crude brimstone is free. As fully two-thirds of the Sicilian exports to France are of refined sulphur, dutiable, it is easy to understand why a tax has been sought on American sulphur, which is 99.9% pure, the result of the method of extraction and not of a separate refining. Every effort has been made by the American company to influence the opinion of the French custom authorities that the Marseilles cargo should be classed as crude brimstone, duty free. Sicilian exports of crude brimstone to America are not taxed, but the tariff on refined sulphur is $8 per ton. It will be interesting to watch the developments in the French sulphur trade, for there are some who believe the taxation incident will pave the way for petitioning Congress when revising the tariff to add crude brimstone to the dutiable list. At New York domestic brimstone seconds are quoted at $21.45, and prime, $21.75 per ton, while deliveries at Baltimore and Philadelphia will be made at an advance of 25c. per ton, and to Portland, Maine, at 15c. more than prices above. Foreign brimstone is nominal at $21.25@$21.50 per ton for best unmixed seconds, and $20.75@$21 for thirds. Pyrite is quiet at 10@10.50c. per unit for domestic lump ore, 42@44% sulphur, f. o. b. shipping port, and 8.5@10c. for fines. Foreign lump ore, 46@52%, unwashed is worth 10@11.5c. per unit at New York, and fines, 9@10c.

Nitrate of Soda.—Momentarily the market is dull, partly because prices are high, and also reflecting the belief in certain European countries that consumption, though increasing, will not equal expectations. It is suggested that speculation is to an extent responsible for the prevailing high prices, but reviewing the statistical position we are led to believe that producers will not deviate much from their present policy. It is noteworthy that recent sales in Chile have been made for delivery into the first quarter of next year at prices that are little below what is asked for early shipment. Comparing current prices with those ruling a year ago, the *oficinas* are realizing an average of 1s. 2d. (32c.) per quintal more, which is significant considering the larger quota of exports for the fourth fiscal year. At New York importers are asking $2.325@$2.35 per 100 lb. for spot, and $2.275@$2.30 for July-December shipment, according to quality.

Sulphate of Ammonia.—There is an undertone of strength in this market, apparently initiated by speculation abroad. Good gas liquor, 24@25%, is quoted at $3.17@$3.20 per 100 lb. for immediate delivery, and $3.20@$3.225 for futures.

Saltpeter.—The consumption in the United States in 1904 is estimated at 68,021 bags, against 70,708 bags in 1903; showing a decrease of 2,687 bags, or 3.8%. Stocks on hand December 31, 1904, were 190 bags, and reported shipments to this country 7,407 bags, making the visible supply 7,597 bags, which compares with 7,826 bags a year ago. Current prices for crude saltpeter are 4c. per lb. for spot, and 3.85c. to arrive, while granulated is quoted at 4.5c. per pound.

Phosphates.—There is a lull in trade, European consumers believing that by withholding orders they can change the opinion of miners, who look for higher prices. Fortunately for exporters stocks of phosphates at mines are comparatively small, and the knowledge that few companies are the owners, lends hope for a more stable market in future. In mining centers, particularly in Florida, there has been marked expansion in working during recent months, and some of the larger hard-rock companies are erecting new plants. Transportation facilities are also being improved, and much is expected when the new Buttgenbach road has been completed to Port Inglis. Port Inglis promises to be the largest export point for Florida hard-rock in the not distant future, as may be judged from the preparations of the Dunnellon-Buttgenbach interests. Some attention has recently been paid to the discovery of apatite, analyzing as high as 44% phosphoric acid, in the Grapevine mining district, east of Banner, bordering the desert, in San Diego county, California. The discovery was made by David McGregor. Transportation is the problem that will decide the development of the 2,000 acres located.

Foreign phosphates are quiet, partly because several of the larger miners have their output under contract for some time to come, and are not in a position to take new orders. Shipments from the Polynesian islands, as is usual from December to April, are interrupted by monsoons. As a whole better prices are ruling, and, as in America, exporters are holding for a higher schedule.

Ocean freights are as follows, per ton:

Ports.	So. Car.	Bone, Algeria.	Sfax, Tunis.	
Baltic	$3.24@3.48	.....	.....	.....
Continental	3.00@3.12	.....	$1.80@2.04	.....
Mediterran'n	3.24@3.36	$2.88	2.04	$2.28
U't'd King'm	3.00@3.24	2.76@2.88	1.38@1.50	1.98

Charters are few, while shipowners are inclined to steady their rates.

Phosphates are quoted as follows, per ton:

Phosphates.	F. o. b.	C. i. f. Gt. Britain or Europe.
*Fla., hard rock	$7.25@7.50	$10.67@11.85
land pebble	3.75@4.00	7.70@ 8.40
†Tenn., 78@80%	4.00@4.25	10.27@10.67
78%	3.75@4.00	.....
75%	3.25@3.50	.....
‡So. Car. land rock	3.25@3.50	.....
river rock	3.00@3.25	6.38@ 6.67
Algerian, 63@70%	.....	7.04@ 7.71
58@63%	.....	6.15@ 6.60
Tunis (Gafsa)	.....	6.00@ 6.60
Christmas Isle	.....	13.28@14.11
Ocean Isle	.....	13.60@1.445
Somme, Fr	.....	11.39

* F. o. b. Florida or Georgia ports. † F. o. b. Mt. Pleasant. ‡ On vessel, Ashley River, S. C.

Liverpool. Dec. 21.

(Special Report of Joseph P. Brunner & Co.)

Soda ash is in steady demand. For tierces, nearest values are about as follows: Leblanc ash, 48%, £5@£5 10s.; 58%; £5 10s.@£6, per ton, net cash. Ammonia ash, 48%, £4 5s.@£4 10s.; 58%, £4 10s.@£4 15s., net cash. Bags, 5s. per ton under price for tierces. Soda crystals are moving off at generally £3 7s. 6d. per ton less 5% for barrels, or 7s. less for bags, with special terms for a few favored markets. Caustic soda is meeting with a good inquiry and prices are firm as follows: 60%, £8 15s.; 70%, £9 15s.; 74%, £10 5s.; 76%, £10 10s. per ton, net cash. Special quotations for the Continent and a few other export quarters.

Bleaching powder is dull as regards export business while £4 15s.@£5 per ton, net cash, is about range for hardwood, as to market.

Chlorate of potash is quite but steady at £3 1s. 16d.@£3 3s. 16d. per lb., net cash, as to quantity and market.

Bicarbonate of soda is unchanged and selling at £6 15s. per ton less 2½% for the finest quality in 1 cwt. kegs, with usual allowances for larger packages, also special terms for a few favored markets.

Sulphate of ammonia is dull on spot at £13 2s. 6d.@£13 3s. 6d. per ton, less 2½% for good gray, 24@25% in double bags f. o. b. here.

Nitrate of soda is in moderate request on spot at £11 5s. per ton for ordinary, up to £11 10s. per ton for refined, in double bags f. o. b. here, less 2½%.

Metal Market.

New York, Jan. 11.

Gold and Silver Exports and Imports.

At all United States Ports in November and year.

Metal.	November.		Year.	
G'ld	1903.	1904.	1903.	1904.
Exp	$993,150	$26,813,443	$42,882,178	$107,709,000
Imp	11,370,690	4,714,452	48,037,398	81,414,345
Exc	I.$10,377,540	I.$16,098,991	I.$5,155,220	E$26,294,655
Silv				
Exp	6,067,762	3,405,566	34,094,689	46,020,584
Imp	2,556,426	2,452,395	21,895,853	23,692,105
Exc	E.$3,511,336	E. $953,171	E$12,198,836	E $22,328,47

Thes exports and imports cover the totals at all United States ports. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Exports and Imports, N.Y.

For the week ending January 7 and for years from January 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	I Eports.
Week	$2,356,370	$32,100	$755,921	$29,699
1905.....	2,356,370	32,100	755,921	29,699
1904.....	84,591	625,709	814,450	25,208
1903.....	17,900	534,654	458,190	39,634

Gold exports were principally to the Argentine Republic and France; of silver, mostly to London. Imports were chiefly from Central America.

Business generally opens well for the new year. The outward movement of gold continues, $500,000 having been taken this week to go to Europe, and $500,000 to go to Buenos Aires, on London account. The total exports since the present movement began, about the end of October, have been over $40,000,000.

The statement of the New York banks—including the 56 banks represented in the Clearing House—for the week ending January 7 gives the following totals, comparisons being made with the corresponding week of 1904:

	1904.	1905.
Loans and discounts.	$915,992,200	$1,069,742,700
Deposits.....	905,713,300	1,109,168,600
Circulation.....	44,697,600	43,172,400
Specie.....	166,401,900	203,684,000
Legal tenders.....	74,713,400	85,216,400
Total reserve.....	$241,115,300	$288,900,400
Legal requirements.	226,428,325	277,292,150
Balance surplus..	$14,686,975	$11,608,250

There are few notable changes in the opening week of the new year. Deposits continue large as also loans and discounts, but the balance of surplus is smaller than a year ago.

The following table shows the specie holdings of the leading banks of the world at the latest dates covered by their reports. The amounts are reduced to dollars.

	1905.	
	Gold.	Silver.
N. Y. Ass'n.....	$203,684,000	.....
England.....	149,980,465	.....
France.....	469,307,905	$219,921,875
Germany.....	154,370,000	54,240,000
Spain.....	72,780,000	95,420,000
Netherlands.....	21,036,000	32,804,500
Belgium.....	15,613,335	7,806,665
Italy.....	108,520,000	17,371,500
Russia.....	426,375,000	35 690,000
Austria.....	231,165.000	61,005,000

The returns of the Associated Banks of New York are of date January 7, and the others January 8, as reported by the *Commercial and Financial Chronicle* cable. The New York banks do not report silver separately, but specie carried is chiefly gold. The Bank of England reports gold only.

The price of silver has declined sharply, chiefly on account of smaller inquiry from the Indian bazaars. The tone of the market at the close, however, seems to be slightly improved.

The United States Assay Office in New York reports receipts of 114,000 oz. of silver during the week.

Shipments of silver from London to the East for the year up to December 15 are reported by Messrs. Pixley & Abell's circular as follows:

	1903.	1904.	Changes.
India	£7,423,330	£9,527,618	I. £2,104,288
China	310,060	512,792	I. 202,732
Straits	821,879	79,268	D. 742,611
Totals...	£8,555,269	£10,119,678	I. £1,564,409

Receipts for the week were £112,000 in bar silver from New York. £3,000 from the West Indies, and £2,000 from Australia: total, £117,00. Shipments were £95,450 in bar silver to Bombay, £31,134 to Hong Kong, and £5,000 to Calcutta; total, £131,584.

Indian exchange has been strong, and the demand for money in India is good The Council bills offered in London were taken at an average of 16.06d. per rupee. Buying of silver for India continues fair.

Prices of Foreign Coins.

	Bid.	Asked.
Mexican dollars.....	$0.47¼	$0.48¼
Peruvian soles and Chilean pesos ..	.43	.45
Victoria sovereigns.....	4.85½	4.87
Twenty francs.....	4.78	3.90
Spanish 25 pesetas	4.78	4.82

Other Metals.

Daily Prices of Metals in New York.

	Copper.			Tin.	Lead.	Spelter.	
January.	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St Louis, Cts. per lb.
5	15 @15½	14⅞ @15	68¼	29½	4.60	6.17½ @6.20	6.00
6	15 @15½	14⅞ @15	68¾	29½	4.60	6.17½ @6.20	6.00
7	15 @15½	14⅞ @15	....	29⅝	4.60	6.17½ @6.20	6.00
9	15 @15½	14⅞ @15	68	29½	4.60	6.20 6.20	6.05
10	15 @15½	14⅞ @15	68	29½	4.60	@6.22½ 6.20	6.05
11	15 @15½	14⅞ @15	68	29½	4.60	@6.22½	6.05

London quotations are per long ton (2,240 lb.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wire-bars. Cathodes are usually 0.25c. below the price of electrolytic.

SILVER AND STERLING EXCHANGE.

January.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	January.	Sterling Exchange.	Silver. New York. Cents.	Silver. London, Pence.
5	4.87	60⅝	27 1/16	9	4.87¼	60¼	28
6	4.8715	60⅜	27¼	10	4.87¼	60¼	27 1/16
7	4.8725	60⅜	27 1/16	11	4.8745	59¾	27⅞

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, .925 fine.

Copper.—The week was characterized by extreme quietude. Consumers in Europe, as well as in this country, have refrained from entering the market as purchasers. Considerable business was proposed from China, and it is reported that some transactions of larger magnitude have been consummated. The closing quotations are given as 15@15¼ for Lake Copper; 14⅞@15c. for electrolytic in ingots, cakes and wirebars, 14⅝@14¾c. in cathodes; 14½@14⅝c. for casting copper.

The market for standard copper in London, which closed last week at £68 15s., opened a trifle lower on Monday at £68 12s. 6d., shading off further until, on Wednesday, the closing quotations are cabled as £68 10s.@£68 12s. 6d. for spot, £68 15s.@£68 17s. 6 d. for three months.

Refined and manufactured sorts we quote: English tough, £71 5s.@£71 10s.; best selected, £72@£72 10s.; strong sheets, £81@£82; India sheets, £77@£78; yellow metal, 6½@6⅝d.

Tin has fluctuated to a moderate extent during the week under review, and spot tin is still held at a premium over import figures. Consumptive demand remains satisfactory. The closing quotations are 29⅛c. for spot, 28⅞c. for futures.

The foreign market, which closed last week at £133, opened somewhat weaker on Monday at £132 5s., declined further to £131 on Tuesday, but recovered again and on Wednesday the closing quotations are cabled as £131 5s.@£131 7s. 6d. for spot, £131@£131 5s. for three months.

Lead remains unchanged with a remarkably good demand from consumers for this season of the year. The closing quotations are 4.60c. New York, 4.52½c. St. Louis.

The foreign market has fallen off somewhat in consequence of pressure to sell Spanish lead arriving there, and at the close the quotations are cabled as £13 for Spanish, £13 2s. 6d. for English lead.

St. Louis Lead Market.—The John Wahl Commission Co. telegraphs us as follows: Lead is firm, but very quiet. Ordinary Missouri brands are selling at 4.52½c. Corroding lead is 4.62½c., East St. Louis.

Spanish Lead Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of December 24, that the price of silver for the week has been 15 reales per oz. Exchange is 34.04 pesetas to £1. Local quotation for pig lead is 71.75 reales per quintal, which, on current exchange, is equal to £11 15s. 11d. per long ton, f. o. b. Cartagena. Exports were 128 tons desilverized to Marseilles and 618 tons argentiferous lead to London.

Spelter continues in good demand at steadily improving prices. The ruling quotations are 6.20@6.22½c. New York, 6.05c. St. Louis.

The foreign market continues in the same firm condition, good ordinaries being quoted at £25 5s., specials £25 10s.

St. Louis Spelter Market.—The John Wahl Commission Co. telegraphs us as follows: Spelter is still on the boom. The latest sales are on a basis of 6.15c., East St. Louis. As the market advances buyers become more anxious and sellers fewer.

Spanish Zinc Ore Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of December 25, that large sales of both blende and calamine have been effected for delivery over 1905, both for Swansea and Belgium. Blende, 35% zinc, is quoted at 75 fr. per ton, and calamine, 30% zinc, at 54 fr. per ton. Exports for the week were 310 tons blende to Swansea and 1,850 tons to Antwerp.

Antimony remains unchanged with good inquiry. We quote: Cookson's at 8¼@8½; Hallett's, 8@8¼; U. S., French, Hungarian, Japanese, Italian and Chinese, 8@8⅛ per pound.

Nickel.—Producers quote 50@47c. per lb. for large quantities down to ton lots, according to size and terms of order. The price for smaller lots is higher, according to quantity, running up to 60c. for small orders.

Platinum.—Quotations are firm, at $19.50 per ounce.

Platinum in manufactured forms is strong. Messrs. Eimer & Amend, of New York, quote for different forms, as follows: Heavy sheet and rod, 72c. per gram; foil and wire, 74c.; crucibles and dishes, 78c.; perforated ware, 85c., and cones, $1 per gram.

Quicksilver.—Prices are steady. In New York large lots can be had at $40 per flask, and $41@$41.50 for smaller orders. The San Francisco quotations are $42@$42.50 for domestic orders, and $41 for export. The London price is £7 15s. per flask, with the same figure quoted by second hands.

Cadmium.—Metallic cadmium, guaranteed 99.5%, is selling in quantities of 100-kg. or over at 710 marks per 100 kg., packing included, f. o. b. Hamburg. This is equivalent to 76.6c. per lb. Prices are for net cash.

Minor Metals and Alloys.—Thalium is quoted at 60@65 marks per kg. at Breslau, Germany. Manganese metal is quoted at 360 marks per 100 kg., f. o. b. Bremen, Germany. Manganese tin alloy, 55%, is quoted 365 marks per 100 kg. for first quality and 225 marks for second quality, both f. o. b. Bremen.

For other minor metals and their alloys, wholesale prices, f. o. b. works:

	Per lb.
Aluminum.	
No. 1. 99% ingots	33@37c.
No.2. 99% ingots	31@34c.
Rolled Sheets	4c. up
Aluminum-Bronze	20@23c.
Nickel-alum	33@39c.
Bismuth	$2.10
Chromium, pure (N. Y.)	80c.
Copper, red oxide	50c.
Ferro-Molybdenum (50%)	$1.00
Ferro-Titanium (20@25% N. Y.)	75c.
Ferro-Chrom. (74%)	.12½c.
Ferro-Tungsten (37%)	.45c.
Magnesium, pure (N. Y.)	$1.60
Manganese, (98@99% N. Y.)	.75c.
Manganese Cu., (30@70% N. Y.)	40c.
Molybdenum, (98@99% N. Y.)	$2.75
Phosphorus, foreign	45c.
Phosphorus, American	70c.
Tungsten (best)	$1.25

Prices vary, chiefly according to size and terms of orders.

Missouri Ore Market.

Jan. 7.

The highest price paid for zinc ore was $55 per ton, the product of five mines selling at this figure. The assay basis ranged from $47 to $52 per ton of 60% zinc. This is the first time since April, 1899, that zinc ore has reached quite so high a price. This year, however, there were five bins sold at that price, while in 1899 there was only one, and other grades are now selling on a proportionately high market price, that were then far below the fancy price paid for one lot of ore. The competition of 1899 was for a few bins of the choicest product, and there was a considerable stock of ore on hand. Now the competition is equally strong on all grades and there is no reserve stock at all, it being all cleaned up with the close of 1904; the week's shipment records the week's output. Lead is in equally strong demand and the price ranges from $60 to $62 per ton.

Following are the shipments of zinc and lead from the various camps of the district for the week ending Jan. 7:

	Zinc lb.	Lead lb.	Value.
Joplin	2,512,780	382,540	$74,300
Carterville-Webb City	1,760,410	308,210	51,500
Duenweg	842,120	93,430	26,660
Galena-Empire	955,340	123,810	26,640
Badger	386,550	.....	10,240
Prosperity	245,620	97,740	9,320
Aurora	574,650	11,470	9,090
Granby	470,270	70,000	8,050
Oronogo	314,240	.....	7,770
Zincite	195 240	9,670	5,190
Neck City	167,420	.....	4,520
Carthage	70,510	.....	4,430
Baxter	177,600	10,800	4,120
Alba	135,110	14,480	4,010
Beef Branch	91,720	40,740	3,890
Sherwood	49,390	11,560	1,890
Spurgeon	50,310	24,720	1,850
Stott City	60,390	.....	1,510
Central City	51,240	4,540	1,370
Totals	9,110,910	1,199,710	$256,350
Zinc value, the week,	$217,510		
Lead value, the week,	38,840		
Last year	10,624,640	1,252,730	$201,510

MONTHLY AVERAGE PRICES OF COPPER IN NEW YORK.

	— Electrolytic. —		—Lake.—	
	1903.	1904.	1903.	1904.
January	12.159	12.410	12.361	12.553
February	12.778	12.063	12.901	12.245
March	14.416	12.299	14.572	12.551
April	14.454	12.923	14.642	13.120
May	14.435	12.758	14.618	13.000
June	13.942	12.269	14.212	12.399
July	13.094	12.380	13.341	12.505
August	12.962	12.343	13.159	12.468
September	13.205	12.495	13.345	12.620
October	12.801	12.993	12.954	13.118
November	12.617	14.284	12.813	14.456
December	11.952	14.661	12.084	14.849
Year	13.243	12.823	13.417	12.990

MONTHLY AVERAGE PRICES OF STANDARD COPPER IN LONDON.

Month.	1903.	1904.	Month.	1903.	1904.
Jan.	53.52	57.500	July.	56.64	57.256
Feb.	57.34	56.500	August	58.44	56.952
March.	63.85	57.321	Sept.	56.82	57.645
April.	61.72	58.247	Oct.	55.60	60.012
May	61.73	57.321	Nov.	56.30	65.085
June	57.30	56.398	Dec.	56.36	66.375
			Av., year	57.97	58.884

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York.		London.	
	1903.	1904.	1903.	1904.
January	47.57	57.055	21.98	26.423
February	47.89	57.592	22.11	26.665
March	48.72	56.741	22.49	26.164
April	50.56	54.202	23.38	24.974
May	54.11	55.430	24.89	25.578
June	52.86	55.673	24.29	25.644
July	53.92	58.095	24.86	26.760
August	55.36	57.806	25.63	26.591
September	58.00	57.120	26.75	26.349
October	60.36	57.923	27.89	26.760
November	58.11	58.453	27.01	26.952
December	55.375	60.563	25.73	27.930
Year	53.57	57.221	24.75	26.483

MONTHLY AVERAGE PRICES OF LEAD IN N. Y.

Month.	1903.	1904.	Month.	1903.	1904.
Jan.	4.075	4.347	July.	4.075	4.192
Feb.	4.075	4.375	August	4.075	4.111
March.	4 442	4.475	Sept.	4.243	4.200
April.	4.567	4.475	Oct.	4.375	4.200
May	4.325	4.423	Nov.	4.218	4.200
June	4.210	4.196	Dec.	4.162	4.600
			Av., year	4.237	4.309

MONTHLY AVERAGE PRICES OF SPELTER.

	—New York.—		— St. Louis. —	
	1903.	1904.	1903.	1904.
January	4.865	4.863	4.689	4.673
February	5.043	4.916	4.681	4.717
March	5.349	5.057	5.174	4.841
April	5.550	5.219	5.375	5.038
May	5.639	5.031	5.469	4.853
June	5.697	4.760	5.537	4.596
July	5.662	4 873	5.507	4.723
August	5.725	4.866	5.550	4.716
September	5.686	5.046	5.514	4.896
October	5.510	5.181	5.350	5.033
November	5.038	5.513	4.886	5.363
December	4.731	5.872	4.556	5.720
Year	5.375	5.100	4.931	5.191

Dividends.

Company.	Payable.	Rate.	Amount.
American Cement	Jan. 20	$0.30	$60,000
†Am. Sm. & Ref., com	Jan. 17	1.25	625,000
†Am. Sm. & Ref., pf.	Jan. 10	1.75	875,000
*Bunker Hill & Sull	Jan. 4	.25	75,000
†Central C. & C., com.	Jan. 16	1.50	76,875
†Central C. & C., pf	Jan. 16	1.25	23,438
Continental Zinc	Jan. 3	.50	11,000
§Dominion Coal, pf	Jan. 3	4.00	120,000
*Dos Estrellas, Mex.	Jan. 15	4.75	14,250
§Empire St. & I., pf	Jan. 2	1.50	35,550
†General Chem., pf.	Jan. 3	1.50	150,000
†Guggenheimer Explora.	Jan. 10	1.75	183,750
*Imperial Oil, Cal.	Jan. 6	.20	20,000
Int'l Sm. Powder	Jan. 3	.50	45,000
†Iron Silver, Col	Jan. 1	.10	50,000
*Natividad, Mex	Jan. 15	5.00	12,000
*New Century Zinc	Jan. 3	.01¼	2,250
New Idria, Cal	Jan. 2	.30	30,000
†Nova Scotia St., pf.	Jan. 16	2.00	20,600
N. Y. & Hond., Rosario.	Jan. 21	.10	15,000
Osceola, Mich	Jan. 27	2.00	192,300
*Peerless Oil, Cal	Jan. 1	.14	12,880
*Penna. Con., Cal.	Jan. 15	.10	5,150
*Penoles, Mex.	Jan. 15	18.30	45,750
†Phila. Gas, com	Feb. 1	.75	398,888
*Pocahontas, Colliery pf.	Jan. 1	.50	7,500
*Silver King, Utah	Jan. 10	.66⅔	100,000
†Sloss-Sheffield, pf	Jan. 3	1.75	117,250
†Spearfish, S. D	Jan. 15	.01¼	22,500
Temple Iron	Jan. 3	3.00	75,000
Tenn. Copper	Jan. 25	1.25	218,750
*Thirty-three Oil, Cal.	Jan. 6	.10	10,000
*Twenty-eight Oil, Cal.	Jan. 3	.15	9,000
*Union, Mex.	Jan. 15	2.30	6,900
†Union Nat. Gas.	Jan. 15	2.00	45,000
†Union Oil, Cal.	Jan. 15	.70	36,870
*United Gold, Col.	Jan. 5	.00½	20,046
†United Zinc, pf	Jan. 15	.75	14,247
Utah Con., Utah	Jan. 16	1.50	450,000
†Va.-Car. Chem., pf.	Jan. 16	2.00	360,000

*Monthly. †Quarterly. §Semi-annual.

Assessments.

Company.	Delinq.	Sale.	Amt.
Alpha Con., Nev.	Jan. 4	Jan. 20	$.05
Andes, Nev.	Jan. 26	Feb. 17	.10
Arctic, Cal.	Jan. 15	.....	.06
Beck's Salt, Utah	Jan. 16	Feb. 2	.20
Canton Placer, Cal.	Jan. 30	.....	.01
Challenge Con., Nev.	Dec. 19	Jan. 10	.10
Con. Cal. & Va., Nev.	Feb. 7	Feb. 28	.25
Confidence, Nev	Jan. 17	Feb. 7	.20
Copper Ranch, Utah	Dec. 26	Jan. 16	.00½
Elsie, Utah	Jan. 2	Feb. 12	.04
Lower Mammoth, Utah	Jan. 21	Feb. 10	.05
Marina Marsicano	Jan. 17	.....	.05
Mexican, Nev.	Jan. 10	Jan. 31	.05
Monster, Utah	Jan. 4	Jan. 25	.00½
New Montezuma, Cal.	Jan. 25	.....	.02
Overman, Nev	Jan. 5	Jan. 24	.10
Red Slide, Cal.	Jan. 13	.....	.05
Ridge & Valley, Utah	Dec. 28	Jan. 14	.00½
Savage, Nev.	Jan. 6	Jan. 27	.10
Seg. Belch. & Mides	Feb. 7	Feb. 27	.05
Sharp, Utah	Dec. 15	Jan. 5	.00½
Silver-Copper, Utah.	Dec. 19	Jan. 9	.01
Utah Con., Nev.	Jan. 12	Feb. 2	.10
Yellow Jacket, Nev.	Jan. 11	Feb. 16	.10

Salt Lake City.*

Company.	Par Val.	High.	Low.	Shares
Beck Tunnel	....	.09½	.09½	500
Butler-Liberal	$1	.12½	.12½	200
Carisa	1	.11½	.10	4,700
Con. Mercur	1	.36½	.36	600
Daly	20	2.56	2.56	100
Daly-Judge	1	5.15	5.00	250
Daly-West	20	12.25	12.25	100
Eagle & Blue Bell	....	.80	.80	200
Little Chief	1	.02½	.02½	3,000
Lower Mammoth	1	.15	.07½	5,500
May Day	1	.13½	.19½	44,200
Mammoth	20	1.20	1.16½	1,000
N. Y. Bonanza	1	.50	.24½	41,500
Ontario	....	4.00	4.00	100
Sacramento	....	.10	.10	2,000
Silver Shield	....	.08	.07½	4,500
Star Consolidated	1	.15½	.11	6,500
Tetro	1	.21	.17	2,800
Uncle Sam Consolidated	1	.22	.21	7,200
Utah	....	.36	.36	100
Victoria	1	2.10	1.99	1,900
Wabash	1	1.90	1.80	1,500
Yankee Consolidated	1	.36½	.35	2,200

*By our Special Correspondent. Total sales, 130,650 shares.

STOCK QUOTATIONS.

Colorado Springs (By Telegraph).

Company	Jan. 9 H.	Jan. 9 L.	Jan 10 H.	Jan 10 L.
Anaconda	.13½	....	....	....
C. K. & N.	.23	.20	....	....
Cripple Ck. Con.	.11	.10¾	....	....
Doctor Jack Pot	.04	.03¾	....	....
Elkton Con.	.68	.67½	....	....
El Paso	1.28	1.26½	....	....
Gold Dollar	.06¾	.06¼	....	....
Gold Sovereign	.09	.08½	....	....
Isabella	.27½	27.¾	....	....
Jack Pot	.06¼	....	....	....
Last Dollar	....	....	....	....
Mollie Gibson	.05¾	.04¾	....	....
Moon Anchor	.06¾	....	....	....
Old Gold	.09	.08¾	....	....
Pharmacist	.04	....	....	....
Portland	2.00	1.80	....	....
Vindicator Con.	.77	....	....	....
Work	.12¾	.12¼	....	....

Duluth, Minn.

Company.	Par Val.	Bid.	Ask.
Black Mountain	$1	$1.10	$1.25
Calumet & Arizona	10	114.00	115.00
Calumet & Pittsburg	10	6.00	7.00
Houghton Development	10	6.00	7.00
Junction Development	15	72.00	73.00
Lake Superior & Pittsburg	10	50.50	51.00
Pittsburg & Duluth	15	25.50	26.00
Shakespeare	1	.....	.20
United Mexican	10	.....	.25
Wolverine & Arizona	10	6.50	7.00

St. Louis, Mo.* Jan. 7

Company.	Par Val.	Bid.	Ask.
Am. Nettie, Colo.	$10	$0.15	$0.20
Center Creek	10	1.40	1.75
Central Coal & C.	100	61.25	64.00
Central C. & C., Pf.	100	70.50	73.00
Central Lead, Mo.	100	120.00	125.00
Columbia Lead Mo.	10	.25	1.90
Con. Coal, Ill	100	120.00	125.00
Doe Run Lead, Mo.	100	115.00	120.00
Granite Bimet., Mont.	10	.35	.40
St. Joe Lead, Mo.	10	15.50	17.00

*By our Special Correspondent.

Montreal.* Jan. 7

Company	Par Val.	High	Low	Sales
Dominion Coal	100	62.00	61.25	155
Dominion Coal, Pf.	100	114.00	.....	75
Dom. I. & St.	100	19.50	18.50	1,887
Dom. I. & St., Pf.	100	65.87½	60.00	1,374
Montreal Steel	100	.....	.....	.....
Montreal Steel, Pf	100	.....	.....	.....
Nova Scotia St.	100	68.00	66.25	665
N. S. Steel, Pf.	100	.....	.....	.....

*Montreal Stock Exchange.
Total sales, 4,156 shares.

San Francisco (By Telegraph).

Company.	January 9	January 10
Belcher	.25	.....
Best & Belcher	1.10	.....
Caledonia	.51	.....
Challenge Con.	.23	.....
Chollar	.33	.....
Confidence	.75	.....
Con. California & Virginia	1.70	.....
Crown Point	.19	.....
Gould & Curry	.32	.....
Hale & Norcross	1.25	.....
Mexican	1.85	.....
Ophir	5.75	.....
Overman	.28	.....
Sierra Nevada	.53	.....
Union Con.	.72	.....
Yellow Jacket	.30	.....

San Francisco.*

Company.	Location.	Opening. H.	Opening. L.	Closing. H.	Closing. L.	Sales.
MacNamara	Nev.	.30	.27	.31	.30	19,500
Mont. Tonopah	Nev.	187½	1.85	1.90	1.85	8.750
Ton. Belmont	Nev.	.69	.67	.69	.68	6.900
Ton. Midway	Nev.	.34	.33	.35	....	5.000
Ton. Mg. Co.	Nev.	9.75	962½	1000	....	500
Ton. North Star	Nev.	.20	....	.22	.20	6,000

*San Francisco & Tonopah Exchange.
Total sales, 46,650 shares.

New York.

Company.	Par Val.	Jan. 4 H.	Jan. 4 L.	Jan. 5 H.	Jan. 5 L.	Jan. 6 H.	Jan. 6 L.	Jan. 7 H.	Jan. 7 L.	Jan. 9 H.	Jan. 9 L.	Jan. 10 H.	Jan. 10 L.	Sales.
Amalgamated	100	74¼	72¼	74¼	72¼	75	72¼	74	72¼	74¼	73	....	....	.....
Anaconda	25	109½	108	109¼	108	110	108	108½	105½	107½	106	....	....	.....
Anaconda Gold	3	....	....	....	....	....	....	....	....	....	....	....	....	.....
Belcher	1	....	....	....	....	....	....	....	....	31	30	....	....	.....
Best & Belcher	3	....	....	....	....	....	....	....	....	1.50	1.40	....	....	.....
Caledonia	1	.55	....	.53	....	....	....	....	....	....	....	....	....	.....
Challenge	2½	....	....	....	....	.29	.28	....	....	....	....	....	....	.....
Chollar	50	.39	.38	....	....	....	....	....	....	....	....	....	....	.....
C. K. & N.	1	....	....	....	....	....	....	.25	....	....	....	....	....	.....
Confidence	3	.85	....	....	....	....	....	....	....	....	....	....	....	.....
Con. Cal. & Va.	2½	2.10	....	2.00	1.95	1.90	....	1.95	1.90	1.95	....	....	....	.....
Cripple Creek Con.	1	....	....	....	....	....	....	....	....	.12	....	....	....	.....
Crown Point	1	....	....	....	....	.22	....	....	....	....	....	....	....	.....
Elkton Con.	1	.71	.70	.70	....	....	....	....	....	....	....	....	....	.....
Federal Mining and Smelting	100	....	....	....	....	....	....	....	....	....	....	....	....	.....
Preferred	100	76	75½	75	....	75¼	....	....	....	....	....	....	....	.....
Gould & Curry	1	....	....	....	....	.41	.40	....	....	....	....	....	....	.....
Greene Consolidated Copper	10	26½	25½	25¾	25	26¼	25¾	25¼	25¼	26	25½	....	....	.....
Greene Consolidated Gold	10	7½	6¾	7¼	6¾	7½	6¾	7	6¾	7	6¾	....	....	.....
Hale & Norcross	3	....	....	....	....	1.40	....	....	....	1.70	....	....	....	.....
Homestake	100	....	....	....	....	....	....	....	....	....	....	....	....	.....
Horn Silver	20	....	....	....	....	....	....	....	....	....	....	....	....	.....
Iron Silver	....	....	....	....	....	....	....	....	....	....	....	....	....	.....
Isabella	1	....	....	.28	....	.29	....	.29	....	....	....	....	....	.....
Julia	1	....	....	.07	....	....	....	....	....	....	....	....	....	.....
Kingston & Pembroke	10	.12	....	....	....	....	....	....	....	....	....	....	....	.....
Little Chief	50	.06	....	....	....	....	....	....	....	....	....	....	....	.....
Mexican	3	....	....	2.05	....	2.05	....	....	....	....	....	....	....	.....
Mollie Gibson	5	....	....	....	....	.05	....	....	....	....	....	....	....	.....
Moulton	25	....	....	....	....	....	....	.16	....	....	....	....	....	.....
Ontario	100	....	....	4.00	....	....	....	....	....	....	....	....	....	.....
Ophir	37	7.25	....	....	....	....	....	7.75	....	7.25	....	....	....	.....
Overman	2	....	....	....	....	....	....	....	....	.35	....	....	....	.....
Phoenix	1	....	....	.13	.11	....	....	....	....	....	....	....	....	.....
Portland	1	....	....	1.75	....	....	....	....	....	1.85	1.80	....	....	.....
Potosi	1	.28	....	.29	....	....	....	....	....	.28	.27	....	....	.....
Quicksilver	100	....	....	....	....	....	....	....	....	....	....	....	....	.....
Quicksilver, pf.	100	....	....	....	....	....	....	....	....	....	....	....	....	.....
Savage	3	.50	....	.55	....	.54	....	....	....	....	....	....	....	.....
Standard	10	....	....	....	....	....	....	....	....	....	....	....	....	.....
Tennessee Copper	25	37½	37	37½	37½	36¼	35½	30½	36½	35½	35	....	....	.....
Union Consolidated	1	....	....	....	....	....	....	....	....	....	....	....	....	.....
Union Copper	10	....	....	1¼	....	1¼	....	....	....	....	....	....	....	.....
United Copper	100	8	....	....	....	....	....	....	....	....	....	....	....	.....
Utah	1	.12	....	....	....	....	....	....	....	....	....	....	....	.....
Vindicator	1	....	....	....	....	.80	....	....	....	....	....	....	....	.....
Work	1	....	....	....	....	....	....	.12	.11	....	....	....	....	.....
Yellow Jacket	3	....	....	....	....	....	....	....	....	.33	....	....	....	.....

Boston, Mass.

Company.	Par Val.	Jan. 4 H.	Jan. 4 L.	Jan. 5 H.	Jan. 5 L.	Jan. 6 H.	Jan. 6 L.	Jan. 7 H.	Jan. 7 L.	Jan. 9 H.	Jan. 9 L.	Jan. 10 H.	Jan. 10 L.	Sales.
Adventure Con	$25	6¼	....	6¼	....	6¼	....	6¼	6¼	6¼	6¼	....	....	.....
Allouez	25	21	20	20½	20½	21¼	20¾	21½	20½	21½	20½	....	....	.....
Amalgamated	100	74¼	72¼	74½	72½	75	72¼	73¼	72½	74¼	73¼	....	....	.....
Am. Z. L. & Sm.	25	12¾	....	12¾	....	....	....	....	....	....	....	....	....	.....
Anaconda	25	....	....	....	....	....	....	....	....	....	....	....	....	.....
Arcadian	25	....	....	....	....	....	....	....	....	....	....	....	....	.....
Arnold	25	....	....	.25	....	....	....	....	....	....	....	....	....	.....
Ash Bed	25	....	....	....	....	....	....	....	....	....	....	....	....	.....
Atlantic	25	18	....	....	....	18¼	18	18	17½	17¾	....	....	....	.....
Bingham Con	50	35	34¾	34½	34¼	34¼	34	34	....	33½	33½	....	....	.....
Bonanza	10	....	....	.80	....	....	....	....	....	....	....	....	....	.....
Boston Con.	5	6¼	6¼	6¼	....	6¼	6¼	6¼	6¼	6¼	6¼	....	....	.....
Calumet & Hecla	25	650	....	....	....	655	650	647½	645	645	....	....	....	.....
Catalpa	10	....	....	....	....	....	....	....	....	....	....	....	....	.....
Centennial	25	26	25½	25½	25½	25½	25	....	....	25	24¼	....	....	.....
Con. Mercur	5	....	....	....	....	....	....	35	....	35	....	....	....	.....
Continental Zinc	25	13½	....	14	....	15	14½	....	....	....	....	....	....	.....
Copper Range	100	70½	68½	70	69	70½	68½	69½	68½	69	68½	....	....	.....
Crescent	10	....	....	....	....	....	....	....	....	....	....	....	....	.....
Daly-West	20	12½	12½	12½	12½	13¼	12½	14½	13¼	14½	14	....	....	.....
Elm River	12	2¾	2½	2¾	....	....	....	2¾	....	....	....	....	....	.....
Franklin	25	12	....	11½	....	....	....	....	....	....	....	....	....	.....
Granby Con.	10	5	....	5¼	5¼	5¼	5	5¼	5¼	5¼	5	....	....	.....
Greene Con	10	26¼	25¼	26	25½	26¼	25¾	25¼	25¼	25½	25¼	....	....	.....
Guanjuato Con.	10	3	....	....	....	....	....	....	....	3	....	....	....	.....
Humboldt	25	....	....	....	....	....	....	....	....	....	....	....	....	.....
Isle Royale Con.	25	27	....	27¼	27	27	26½	26½	....	26½	26	....	....	.....
Mass. Con.	25	9¼	9¼	9¼	9¼	10	9¼	9¼	9¼	....	....	....	....	.....
Mayflower	25	....	....	....	....	1	....	....	....	1¼	....	....	....	.....
Michigan	25	10½	10½	10¼	....	10¾	10¼	10¼	10¼	10½	10	....	....	.....
Mohawk	25	54	53½	53½	53	53½	52	53	....	52½	51	....	....	.....
Montana Coal & Coke	25	....	....	5	4¾	....	....	....	....	....	....	....	....	.....
National	25	1¼	....	....	....	....	....	....	....	....	....	....	....	.....
New Idria	....	....	....	....	....	....	....	....	....	....	....	....	....	.....
Old Colony	25	1½	....	1¾	....	....	....	....	....	....	....	....	....	.....
Old Dominion	25	28½	28	28	27½	28	27½	27½	....	28	27	....	....	.....
Osceola	25	97½	97	....	....	94	93½	94	....	93¾	93½	....	....	.....
Parrot	10	30	....	30½	29½	30	....	....	....	29½	29	....	....	.....
Phoenix Consolidated	25	3¼	....	....	....	3	....	....	....	....	....	....	....	.....
Quincy	25	111	....	110½	110	....	....	....	....	110	....	....	....	.....
Rhode Island	25	....	....	2	1½	....	....	....	....	....	....	....	....	.....
Santa Fe	10	2½	....	....	....	....	....	....	....	2¼	....	....	....	.....
Shannon	10	9	8¾	9	8¾	8¾	8¾	8¾	8¾	....	....	....	....	.....
Tamarack	25	125	....	125	....	125	....	....	....	121	120	....	....	.....
Tecumseh	25	....	....	....	....	2¾	....	2½	....	1½	....	....	....	.....
Tennessee	25	....	....	....	....	....	....	....	....	....	....	....	....	.....
Trinity	25	10¼	10	10	9¾	10	9¾	9¾	....	9¾	9	....	....	.....
United States	25	25¼	24½	24¾	24¼	24½	24¼	24¼	24¼	24¼	22¾	....	....	.....
U. S. Coal & Oil	25	....	....	11¾	11	11¾	....	11¼	11¼	11	10¾	....	....	.....
Utah Consolidated	5	43¼	42½	42¾	42¼	43	42	42½	42¼	42¼	42	....	....	.....
Victoria	25	5½	5	5¼	....	5¼	5¼	5	....	5	....	....	....	.....
Winona	25	12½	12¼	12½	11¾	12	....	12	....	11¾	11¼	....	....	.....
Wolverine	25	105	....	....	....	106	....	105	....	105	....	....	....	.....
Wyandot	25	....	....	....	....	2¼	2	....	....	2¼	1¼	....	....	.....

STOCK QUOTATIONS.

Coal, Iron and Industrial Stocks.

Company.	Par Val.	Jan. 4		Jan. 5		Jan. 6		Jan. 7		Jan. 9		Jan. 10		Sales.
		H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Allis-Chalmers	$100	17	....	16⅞	16⅛	16	....	....	....	....	....	66	....	800
Allis-Chalmers, pf.	100	....	....	65½	....	....	....	....	....	....	....	66	....	200
Am. Agri. Chem.	100	....	....	....	....	....	....	....	....	....	....	....	....	....
Preferred	100	....	....	....	....	....	....	....	....	....	....	....	....	....
Am. Sm. & Ref.	100	83⅛	82⅜	82⅛	82⅛	‡81⅛	80½	80⅛	80½	81	79⅛	81½	80⅛	25,360
Preferred	50	113¾	113	113	....	113	....	113	....	113	....	112½	....	1,800
†Cambria Iron	50	....	....	....	....	....	....	....	....	....	....	48½	....	50
†Cambria Steel	100	26½	....	26⅜	26⅛	26½	26	26	....	26⅛	26	26⅜	26	2,831
Col. Fuel & Iron.	100	48⅛	47½	47⅜	46¼	47½	45⅛	46⅛	45½	47	46	46¼	45⅛	32,050
Col. Fuel & Iron pf	100	95	....	....	....	....	....	....	....	....	....	....	....	100
Col. & H. C. & I.	100	17⅛	17	17½	17	17½	....	....	....	16⅛	16⅛	....	....	800
General Chem.	50	....	....	....	....	....	....	....	....	....	....	....	....	....
General Chem, pf.	50	....	....	....	....	....	....	....	....	....	....	....	....	....
†Lehigh C. & N.	50	114	111	112	110½	111	110	....	....	106½	....	....	....	2,457
*Mong. R. Coal	50	....	....	....	....	....	....	....	....	....	....	....	....	....
*Mong. R. Coal pf.	50	30⅜	30½	31	....	31½	30⅞	....	....	31½	31	....	....	1,425
National Lead	100	24⅛	....	25⅛	24½	25⅛	24½	24⅛	....	25⅛	25	25½	24⅞	7,600
Preferred	100	....	....	98	....	98	97¼	97¼	....	98½	....	98½	98	800
Phila. Nat. Gas	50	41⅜	41½	41½	41⅜	....	....	41¼	....	41¼	....	41⅜	41	749
Preferred	50	46½	46¼	47	46¼	....	....	....	....	47	....	46¼	....	468
Pittsburg Coal	100	23⅜	23	23	21	22½	22⅛	....	....	22½	21½	....	....	3,375
Preferred	100	83⅛	83⅜	83½	82⅞	82½	82	82½	82⅛	82⅜	82⅜	82⅛	82½	995
Republic I. & S.	100	17½	....	16⅜	16½	....	....	....	....	16⅜	16⅛	16½	16½	2,400
Preferred	100	71⅜	71½	70⅜	70½	70½	67½	68⅛	67½	68	67½	62⅜	62½	2,200
Sloss Shef. S. & I.	100	63	....	63	62½	62½	....	....	....	63	62⅜	62⅛	62½	900
Preferred	100	102½	....	....	....	102	....	....	....	....	....	....	....	200
Standard Oil	100	....	....	634½	631	635	630	630	....	635	634½	635	....	215
Tenn. C. I. & R.R.	100	72½	71½	71½	71	71	70½	71	70	71⅜	70½	71	....	9,800
U. S. Steel Corp	100	30⅛	29⅞	30	29⅜	29½	28½	29½	28⅛	30	29	29⅛	29⅛	238,500
Preferred	100	93⅞	92½	93	92½	92½	91½	92	91½	93	91½	92¼	92	211,150
Va.-Car. Chem	100	38½	37⅞	38½	37½	37½	37¼	37½	37¼	38⅜	37½	38½	37½	9,545
Preferred	100	110½	....	109½	109	109	....	109½	....	109	....	109	....	1,000

*Pittsburg Exchange; †Philadelphia Exchange; all others, New York Stock Exchange; ‡Ex-dividend. Total sales, 558,770 shares.

Mexico.

Dec. 30

Company.	Shares Issued.	Prices, Mex. Bid.	Prices, Mex. Ask.
DURANGO:			
Penoles	2,500	$2,600	$3,000
San Andres de la Sierra	200	10,000	.....
GUANAJUATO:			
Cinco Senores y An. aviadoras	2,000	30	33
Cinco, Senores y An. aviada	400	30	33
Providencia, San Juan de la Luz	6,000	148	153
GUERRERO:			
Garduno y Anexas	7,200	30	35
HIDALGO:			
Amistad y Con	9,600	65	68
Carmen, aviada	1,100	200	220
Guadalupe Fresnillo. Mill	1,000	170	200
Guadalupe Fresnillo Mine	1,400	70	80
Maravillas y An., aviador	1,680	90	110
Maravillas el Lobo	1,000	130	180
Refugio, aviada	12,800	5	7
Sta. Gertrudis y An aviadas	9,600	8	10
Sta. Gertrudis y An., aviadora	28,800	68	70
San Rafael y An., Trompillo	1,200	2,100	2,250
San Rafael y An., aviada	1,200	$740	$750
Soledad, aviada	670	1,270	1,300
Sorpresa, aviada	960	290	320
MEXICO:			
Aldebarren	2,000	40	55
Buen Despacho	3,000	60	68
Dos Estrellas	3,000	3,100	3,260
La Esperanza (El Oro)	3,000	1,500	1,500
Santa Ana, Esperanza	2,400	15	30
NUEVO LEON:			
La Fraternal	1,000	580	620
Norias de Bajan	1,000	700	750
SAN LUIS POTOSI:			
Concepcion y An.	3,000	26	30
El Barreno, aviadora	2,000	100	105
Sta. Maria de la Paz	9,600	224	225
ZACATECAS:			
Asturiana y An	2,500	8	12
Candelaria y Pinos	2,500	40	50
San Carlos y Annexas	2,500	35	45
Sta. Maria de Gaud.	2,500	55	72
MISCELLANEOUS:			
Bartolome de Medina	2,000	90	93
Naica (Chihuahua)	100	11,000	13,000
Natividad (Oxaca) aviadora	1,800	800	830
San Francisco Hac.	6,000	70	78
Union Hacienda	3,000	360	375

Paris.

Company.	Location.	Par value.	Latest dividend.	Prices. Opening.	Prices. Closing.
		Fr.	Fr.	Fr.	Fr.
Anzin, Coal	France	.....	290.00	5,725.00	5,710.00
Boleo, c	Lower California	500	104.17	2,245.00	2,260.00
Champ d'Or, g.	South Africa.	25	3.75	16.75	16.75
Courrieres, Coal.	France	500	110.00	2,910.00	2,949.00
Fraser River, g	British Columbia.	25	.....	5.50	5.50
Huanchaca, s.	Bolivia	125	2.50	92.75	93,70
Laurium, z. l.	Greece.	500	25.00	309.00	039.00
Malfidano, z.	Italy	500	50.00	625.00	630.00
Metaux, Cie. Fran. de.	France	500	22.50	510.00	505.00
Mokta-el-Hadid, i. l.	Algeria	500	40.00	1,022.00	1,010.00
Nickel, n.	N. Caledonia	250	22.50	639.00	610.00
Penarroya, Coal	Spain.	500	45.00	1,130.00	1,136.50
Vielle Montagne, z.	Belgium	30	30.00	778.00	778.00

c—Copper g—Gold. i—Iron. l—Lead. n—Nickel. s—Silver. z—Zinc.

London.

Dec. 30

Company.	Par Val.	Latest dividend. Amt.	Latest dividend. Date.	Quotations. Buyers.	Quotations. Sellers.
American:	£ s.	s. d.		£ s. d.	£ s. d.
Alaska-Treadwell	5 0	4 0	Oct., 1904	4 17 6	5 2 6
Anaconda	5 0	2 0	Nov., 1904	5 12 6	5 15 0
Camp Bird.	1 0	9	Nov., 1904	1 9 3	1 9 9
Copiapo	2 0	5 0	Oct., 1904	1 2 6	1 7 6
De Lamar	1 0	2 0	Nov., 1904	16 3	18 9
El Oro	1 0	9	July, 1904	1 1 9	1 2 11
Frontino & Bolivia	1 0	rts.	Mar., 1904	11 0	12 0
Le Roi	5 0	5 0	Nov., 1899	16 3	18 9
Le Roi No. 2	5 0	1 0	June, 1904	1 2 6	1 5 0
Mesquital.	1 0	3	Feb., 1903	2 6	3 0
Montana	1 0	6	Apr., 1899	9	1 3
Palmarejo & Mex.	1 0	3	Nov., 1904	9 3	9 9
Standard	4	1½	Sept., 1903	1 0	2 0
*Stratton's Indep'd.	1 0	6	Dec., 1904	5 3	5 9
*St. John del Rey	1 0	6	Dec., 1904	12 6	13 6
Tomboy.	1 0	1 0	Dec., 1904	1 5 0	1 7 6
*Tyee	1 0	2 0	Dec., 1904	2 0 0	2 2 6
Ymir.	1 0	1 0	Mar., 1902	3 9	6 3
European:					
Libiola	5 0	1 6	May, 1904	1 11 3	1 13 9
Linares.	3 0	5 0	Sept., 1904	4 0 0	4 5 0
Mason & Barry	1 0	7 0	May, 1904	2 17 6	3 2 6
Rio Tinto.	5 0	32 6	Nov., 1904	62 15 0	63 0 0
Rio Tinto, pf	5 0	2 6	Nov., 1904	6 2 6	6 7 6
Tharsis.	2 0	7 0	May, 1904	5 5 0	5 10 0
West Australia:					
Associated.	1 0	2 6	July, 1904	2 1 9	2 2 11
Cosmopolitan	1 0	1 0	Apr., 1904	6 0	6 6
Golden Horseshoe.	5 0	6 0	Nov., 1904	7 2 6	7 5 0
*Great Boulder.	2	9	Dec., 1904	1 2 3	1 2 6
Gt. Boulder Perse.	1 0	1 0	Sept., 1904	10 6	11 0
Great Fingall.	1 0	7 0	Oct., 1904	8 8 9	8 11 3
Ivanhoe	5 0	5 0	Oct., 1904	7 17 6	8 0 0
Kalgurli.	1 0	2 6	Jan., 1905	6 6 3	6 8 9
Lake View	1 0	1 6	Oct , 1904	1 7 6	1 8 9
*Oroya-Brownhill.	1 0	4 0	Dec., 1904	3 10 0	3 11 3
Miscellaneous:					
*Brilliant Central	1 0	1 0	Dec., 1904	1 0 0	1 5 0
Briseis	1 0	.....	.....	10 6	11 6
Broken Hill.	8	1 0	Nov., 1904	2 3 0	2 4 0
Mt. Lyell	3 0	1 3	Dec., 1904	15 0	16 0
Mt. Morgan	1 0	3	Jan., 1905	2 17 6	3 0 0
Waihi.	1 0	2 6	Dec., 1904	6 0 0	6 2 6
Indian:					
Champion Reef.	10	1 5	Jan., 1905	1 13 6	1 14 6
Mysore.	10	4 6	Nov., 1904	6 8 9	6 11 3
Nundydroog	10	1 6	Nov., 1904	1 9 11	1 11 1
Ooregum	10	9	Dec., 1904	17 9	1 0 7
Ooregum, pf.	10	9	Dec., 1904	1 6 3	1 8 9
South African:					
Angelo	1 0	7 0	Aug., 1904	7 3 9	7 6 3
Bonanza	1 0	7 0	Feb., 1905	1 7 6	1 10 0
British So. Africa	1 0	rts.	May, 1899	2 5 3	2 6 5
Cape Copper	2 0	6	Jan., 1905	4 16 3	4 18 9
Cape Copper, pf.	2 0	6	Jan., 1905	4 7 6	4 12 6
City & Suburban.	4 0	6 0	Feb., 1905	6 0 0	6 5 0
*Consol. Gold-F'lds.	1 0	2 6	Dec., 1904	8 3 9	8 5 0
Crown Reef	1 0	18 0	Nov., 1904	15 15 0	16 5 0
De Beers, preferred	2 10	10 0	Feb., 1905	17 18 9	18 1 3
De Beers, deferred	2 10	2 0	Feb., 1905	18 0 0	18 2 6
East Rand.	1 0	5 0	July, 1903	9 5 3	9 6 5
Ferreira	1 0	22 6	Aug., 1904	23 15 0	24 5 0
Geldenhuis.	1 0	5 0	Feb., 1905	5 15 0	5 17 6
Geduld.	1 0	rts.	Mar., 1902	7 13 9	7 16 3
Henry Nourse	1 0	8 0	Feb., 1905	8 5 0	8 10 0
Heriot	1 0	5 0	Sept., 1899	4 2 6	4 7 6
Jubilee	1 0	5 0	Feb., 1905	3 15 0	4 0 0
Jumpers.	1 0	2 6	May, 1904	2 10 0	2 15 0
Knights	1 0	.....	.....	6 15 0	6 17 6
Langlaagte	1 0	2 0	Feb., 1905	3 18 9	4 1 3
May	1 0	4 0	Feb., 1905	4 3 9	4 6 3
Meyer & Charlton.	1 0	5 0	Jan., 1905	5 7 6	5 12 6
Modderfontein	1 0	rts.	Apr., 1902	10 17 6	11 0 0
Namaqua.	2 0	3 0	Dec., 1904	3 10 0	3 12 6
New Goch	1 0	.....	.....	3 10 0	3 12 6
New Jagersfontein.	5 0	15 0	Dec., 1904	29 5 0	29 15 0
New Kleinfortein	1 0	rts.	Apr., 1902	2 11 3	2 13 9
New Primrose	1 0	3 0	Aug., 1904	3 8 9	3 11 3
Rand	5 0	Aug.	1904	11 11 9	11 14 7
Randfontein	1 0	rts.	Apr., 1899	3 5 0	3 6 3
Robinson.	5 0	8 0	Feb., 1905	10 2 6	10 7 6
Robinson Deep	1 0	3 0	Aug., 1904	6 6 3	6 7 6
Rose Deep	1 0	3 0	Feb., 1905	8 17 6	9 2 6
Salisbury	1 0	2 0	Jan., 1905	1 12 6	1 15 0
Sheba	1 0	rts.	Feb., 1904	7 3	7 9
Village Main Reef.	1 0	4 0	July, 1904	7 2 6	7 7 6
Wemmer	1 0	12 6	Dec., 1904	10 15 0	11 0 0

*Ex-dividend.

London (By Cable).*

Company.	Jan. 11 £	s.	d.	Company.	Jan. 11 £	s.	d.
Camp Bird.	1	10	6	Esperanza	1	0	0
Con. Gold Fields.	8	5	0	Modderfontein.	10	13	9
De Beers.	18	0	0	Rand Mines	11	7	6
Dolores	1	8	3	Rio Tinto	62	12	6
East Rand	9	1	10½	Simmer & Jack.	2	6	3
El Oro.	1	2	6	Tomboy	1	6	3

*Furnished by Wm. P. Bonbright & Co., 24 Broad St., New York

Questions and Answers.

Queries should relate to matters within our special province, such as mining, metallurgy, chemistry, geology, etc. Preference will be given to topics which seem to be of interest to others besides the inquirer. We cannot give professional advice, which should be obtained from a consulting expert, nor can we give advice about mining companies or mining stock. Brief replies to questions will be welcomed from correspondents. While names will not be published, all inquirers must send their names and addresses. Preference will, of course, always be given to questions submitted by subscribers.

Iron Ore.—Can you advise where there is a furnace in operation smelting magnetic iron ore approaching 1.5 per cent sulphur and 61 per cent metallic iron?—G. A. H.

Answer.—The consumption of iron ore of high sulphur content, such as you mention, is limited. None of the furnaces of the United States Steel Corporation nor the independent Southern plants will use this character of iron ore, and where it is utilized, as in New Jersey, the custom is to roast before smelting. At Oxford, N. J., the empire Steel & Iron Company employs an ore mined locally, which in the native state contains from 1.25 to 2.5 per cent sulphur. This ore is well roasted preparatory to charging in the furnace. It may be added that there are vast quantities of iron ore available in this country whose sulphur content being excessive, rather handicap their market at a remunerative price.

Mica.—Could you tell me whether there are any manufacturers of mica goods other than the electrical concerns in the United States?—C. F.

Answer.—Judging from similar inquiries received, the opinion is common that the electrical industry consumes nearly all the mica produced. This is not so, for substantial quantities of sheet mica are also employed instead of glass in stove-and furnace-doors, skylights, quarrymen's spectacles, and for kindred purposes. Certain high-priced specialties are also made, such as veils for women autoists (a Parisian novelty). Reconstructed sheet mica, that is waste mica compressed and built into sheets, is marketed in the form of lamp shades, etc., articles that are costly. Scrap mica is also utilized in the preparation of boiler coverings, and, mixed with asbestos, cotton or India-rubber, is sold as patent packing for pipes. Pulverized scrap mica is used for decorative purposes, as an ingredient in lubricants for machinery bearings, as a roofing material, etc. The largest consumer of mica in the world is the United States, which in 1903 produced, chiefly in North Carolina, 90,100 lb. sheet, and 1,693 short tons scrap mica; there were also imported quantities from India and Canada. Among the more important manufacturers of mica goods, with offices in New York City, are Eugene Munsell & Company, 218 Water street; Sills-Eddy Company, 25 Broad street; Standard Oil Company (axle grease), 26 Broadway; Mica Roofing Co., 17 Battery Place.

Recent Decisions.

SPECIALLY REPORTED.

DUTY ON IRON-NICKEL WIRE.—Nickel wire, iron or steel filled, produced by forcing an iron or steel core into a nickel tube or shell, and then drawing the article down to the required size, is dutiable at the rate of 45 per cent ad valorem under the provisions of paragraph 137, act of July 24, 1897, as a wire not specially provided for. Wire thus produced is not a coated wire.—Appeal of Baker & Co. from Collector of Customs at New York; Board of General Appraisers.

DUTY ON STEEL FLOOR-PLATES.—1. Steel floor-plates made with one side checkered to prevent slipping are not dutiable under paragraph 126, act of July 24, 1897, nor under paragraph 125, but are dutiable under paragraph 135, which provides for "plates . . . not specially provided for."

2. The provisions of paragraph 126 cover only boiler or similar plates, and paragraph 125 covers only articles which in their imported state are structural forms.—Appeal of R. D. Wood & Company from Collector of Customs at Philadelphia; Board of General Appraisers.

Abstracts of Official Reports.

Cape Copper Company, Ltd.

This company owns extensive property in the northwest district of Cape Colony, comprising four productive mines and three under development, all in the vicinity of Ookiep; two smelters, a fully equipped railroad 100 miles long, terminating at Port Nolloth; and, at the latter place, docks and cranes, tugs and lighters for shipping matte and unloading coke. The company also has a half interest in the copper mines at Tilt Cove, on the coast of Newfoundland, and in a smelting and chemical plant in Cape Colony. In view of the decreasing reserves in the largest mine, the management is investigating a copper property in Chile, on which it has taken an option. The report covers the year ending August 31, 1904.

Ore mined in the South African properties amounted to 65,112 tons, with an average content of 9 per cent copper. The reserves, after a year of active development, were estimated at 217,000 tons, carrying 6.5 per cent copper. Nearly the whole output was treated at the company's smelters, and was concentrated into about 50 per cent matte, most of which was shipped to Swansea for further treatment.

In Newfoundland, 73,500 tons of ore, carrying 3.72 per cent copper, were mined at an average cost of $1.72 per ton. Reserves were estimated, September 1, at 124,200 tons. This ore is shipped without any treatment, the consignments being about equally divided between Swansea and New York.

Net income for the year, after deducting income tax, was £248,376. From this, dividends aggregating £107,062 were paid January 1 and June 1. The estimated depreciation in market value of the investment, £28,000, was written off, leaving a surplus of £113,313. The company is capitalized at £750,000, of which all but £60,000, out of the authorized £150,000 preferred stock, has been issued.

Champion Reef Gold Mining Company, Ltd.

This company is the leading one of the several whose properties are situated near Kolar, in the State of Mysore, which district contributes nearly the whole gold production of India. The report covers the year ending September 30, 1904, and indicates a gratifying increase over previous periods as to ore removed, development, reserves, milling capacity and efficiency. Milling costs show a reduction, but cost of mining, a slight increase, due to the rapid extension of the mine workings.

Ore hoisted and crushed amounted to 181,948 tons. As a result of the year's development, comprising shafts and winzes, 6,627 ft.; raises, 1,793 ft., and levels and cross-cuts, 12,448 ft., reserves estimated at 419,895 tons have been blocked out.

Of the 215,687 oz. gold obtained, 84.3 per cent came from the batteries, 15 per cent was recovered from sand and slime by cyanide, and the rest by scraping the plates. This total was equivalent to 210,096 oz. fine gold. The mill, as at present operated, contains 220 heavy, modern stamps. Electrical equipment is being installed as rapidly as the supply of energy can be arranged for through power companies.

The income and expense accounts, in condensed form, follow:

By sale of bullion	£817,829
Miscellaneous	9,772
Total receipts	£827,601
Mining	£202,475
Milling	54,604
Cyaniding	26,928
Surface, including repairs	10,567
Administration	6,569
Protection	7,791
Office and management	8,307
Royalty	40,540
Charges on gold shipments	7,238
Total expenses	£365,019
Net income for the year	£462,582
Balance on September 30, 1903	169,924
Premium on new stock	2,648
Available for dividends, etc	£635,154

During the year, dividends amounting to £436,998, equivalent to nearly 168 per cent on £260,000 capitalization, have been paid. Income tax absorbed £17,409, depreciation was estimated at £24,850 and was written off, and miscellaneous grants, with expenses incident upon a splitting of share valuation, amounted to £7,137.

The Kalgurli Gold Mines, Ltd.

The present report of this West Australian company covers the year ending July 31, 1904. It is the work of the manager, F. A. Moss, and we can earnestly recommend it to the attention of all mining or metallurgical companies as a model for consistency, completeness and detail. Weights are given in long tons.

Ore hoisted amounted to 54,056 tons, at a cost of 8s. 5.26d. per ton for all mining expenses, showing an increase of 8,930 in tonnage, and a decrease of 1s. 6.33d. per ton in cost, when compared with the previous year's figures. The cost of loading and trucking, 2s. 4.6d., was the largest item of mining expense, the total charge for explosives, timber, lighting and all supplies, including compressed air, having been only 2s. 2.9d. per ton. A fixed charge of 5s. per ton was allowed for development. Reserves are estimated at 365,000 tons, from which gold to the value of 66s. per ton can be extracted.

The whole output of the mine was treated by amlagamation and cyanidation at a cost of 18c. 9.82d. per ton for the entire process, and the yield, 18.32 dwt. (71s. 4d.) indicates a recovery of 91.1 per cent of the assay value. Compared with the previous year's record, these figures show a reduction of 3s. 2.3d. in milling cost, but also a decrease of 1.2 dwt. (4s. 8d.) in the yield. Additional plant is being erected, by which the capacity will be nearly doubled, still further curtailing the treatment charges.

The profit and loss account follows:

By gold sales	£191,046
Miscellaneous	1,113
Total receipts	£192,159
Mining	£22,807
Milling	50,863
Development @ 5s. per ton	13,514
Depreciation	11,586
Office and administration	2,271
Taxes	7,541
Bonus, fees, etc.	1,035
Total expenses	£109,617
Net income for the year	£82,524
Balance brought forward	30,017
Balance for dividends	£112,613

From this, dividends aggregating £60,000, equivalent to 50 per cent (capital stock, £120,000), were paid during the year; since its close, one quarterly dividend of 12.5 per cent has been paid, and another is promised for January 6.

When in perplexity, first try to find out—what is the trouble? Next, ask, how to remedy it? But be sure to note what will it cost?

That machine is the best which is so simple, strong, and economic that it has been called 'fool-proof.' Thus, one concentrating table may give excellent results, but only in the hands of an expert; while another poorer table may actually do better work with the casual laborer. Sometimes the workman will not give a good machine a fair chance.

Patents Relating to Mining and Metallurgy.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

Week Ending December 27, 1904.

778,269. PROCESS OF ELECTRIC WELDING.—Adolph F. Rietzel, Lynn, Mass., assignor to Thomson Electric Welding Company, Lynn, Mass. A herein-described improvement in welding links or other endless forms by an electric welding process applied to one side of the link, consisting in drawing out the welded side to remove the stress developed in the bended side by the pressure applied to effect the weld.

778,270. PRODUCTION OF METALLIC MAGNESIUM.—Isaiah L. Roberts, New York, N. Y., assignor of one-half to James Turner Morehead, New York, N. Y. A method of producing metallic magnesium, which consists in electrolyzing a fused bath of magnesium fluoride containing a chloride of an alkali.

778,286. MANIPULATION OF REFRACTORY MATERIAL.—Elihu Thomson, Swampscott, Mass., assignor to General Electric Company. A method of forming articles out of quartz or analogous refractory material in a dividad state, which consists in placing a mass of the material in contact with a highly refractory conducting-body, passing a heating-current of electricity through said conducting-body so as to produce fusion of a portion or portions of the material nearest to the refractory body, then discontinuing the heating, and after the parts have cooled removing the fused mass from contact with the refractory body.

778,321. WOOD-PRESERVING COMPOUND.—Antoinette Macaulay, Fort Dodge, Iowa. A wood-preserving compound, consisting of linseed oil, kerosene and sodium silicate, the whole being combined with powdered charcoal.

778,345. PROCESS OF REDUCING METALLIC OXIDES WITH METALLIC ALUMINUM.—Frederick C. Weber, Chicago, Ill. A method of treating metallic oxides with aluminum in the production of metals and metalloids and alloys and their compounds, which consists in subjecting the to-be-treated charge, comprising aluminum in admixture with a metallic oxide reducible by aluminum, to an initial drying for removal of hygroscopic or ordinarily present moisture, thereby completely and absolutely dehydrating the material and then briquetting the dehydrated dry hot charge in a treatment preparatory to reduction of the charge.

778,348. METHOD OF RECOVERING PRECIOUS METALS FROM SOLUTIONS.—Isaac Anderson, Prescott, Ariz., assignor of one-half to Michael Scanlon, Whitehills, Ariz. A process of recovering precious metals from a cyanide solution consisting in introducing soluble chlorides and sulphides into the solution and then adding a mineral acid which will cause the decomposition of the cyanide solution with the formation of compounds of the precious metals and the sulphur and chlorine present.

778,398. ALLOY.—Christopher H. Bierbaum, Buffalo, N. Y. An alloy composed of zinc, copper, aluminum and magnesium; the zinc being in excess of the other metals and the copper being in excess of the aluminum and the aluminum being in excess of the magnesium.

778,452. AIR-SEPARATOR FOR CEMENT-GRINDING MILLS.—Harry Hitzel, Alpha, N. J., assignor, by mesne assignments, to Lehigh Pulverizer Mill Company, Catasauqua, Pa. In a cement-grinding mill, a casing having peripheral outlets, a grinding mechanism located within the casing below the outlets, a settling-chamber located outside the casing and surrounding said outlets, an air-exhausting apparatus located within the casing adjacent to the outlets and above the grinding-path and means for controlling the outlets from the casing.

778,461. FEEDER FOR BELT CONVEYERS.—Lewis J. Robb, Pittsburg, Pa., assignor to Heyl and Patterson, Inc., Pittsburg, Pa. In a feeder for belt conveyers, the combination of the carriage adapted to receive the material, means for discharging the material from said carriage upon the belt conveyer, and means for driving the carriage to any desired point along said belt conveyer by power transmitted from said belt conveyer.

778,483. BRICK-MACHINE.—Harry J. Flood, Chicago, Ill. The combination with a supporting frame, of a mold-table rotatably mounted therein, said mold-table having a series of radially disposed mold-boxes, a plunger carried by each of said boxes, means for actuating two of said plungers simultaneously, one for compressing the material and the other for ejecting the compressed material, a circular track underlying said mold-boxes, one section of said track being rigid and supporting the plungers in their highest position and the other section being vertically adjustable and supporting the plungers in the charging positions of the mold-boxes.

778,493. VALVE FOR BLOWING-ENGINES.—Albert T. Keller, Wilkinsburg, Pa. A blowing-engine having formed in and transversely of its heads cylindrical valve-chambers, each in two sections and having openings in their exterior portions in combination with open-ended hollow cylindrical valves, movable across the space or openings between said sections.

778,502. HOISTING APPARATUS.—Lincoln Moss, New York, N. Y., assignor to the Robins Conveying Belt Company, New York. The combination with a hoisting apparatus comprising a hoisting-bucket and means for operating the same, receiving and discharge hoppers, and an auxiliary carrier extending between said hoppers, of a removing-conveyer independent of said hoisting apparatus and arranged to receive material from said discharge-hopper.

778,547. METHOD OF PRECIPITATING METALS FROM CYANIDE SOLUTIONS AND REGENERATING THE SOLUTIONS.—Lewis E. Porter, Camp Rochester, Cal. A process of separating metals from cyanide solutions and regenerating such solutions, which consists in treating the solution with zinc and ammonia, and separating the metals thereby precipitated.

778,558. APPARATUS FOR TREATING ASPHALT.—Benjamin S. Truxal, Chattanooga, Tenn., assignor to William C. Thoma, Pittsburg, Pa. An apparatus for treating asphalt, the combination of a suitable tube, means for conveying the asphalt through said tube at a certain rate of speed for a portion of its length adjacent to the entrance end thereof, means for conveying said asphalt beyond said first-named portion of said tube at a slower rate of speed, whereby the material is crowded so as to fill up the tube beyond said first-named portion, and means for heating the asphalt during its passage through said tube.

778,561. CONVEYER.—Samuel M. Wixcel, Marcus, Iowa. A conveyer, comprising a supporting-frame, a flexible carrier moving upon said frame, one portion thereof adapted to be telescoped back into the other portion, driving connections for actuating said carrier, and mechanism for automatically extending and retracting the telescoped portion thereof during the movement of said carrier.

778,582. HOISTING AND CONVEYING APPARATUS.—Edwin M. Holmes, Manlius, N. Y.

In a hoisting and conveying apparatus, the combination with an inclined track and a carriage thereon movable by gravity down the track, a cable to draw the carriage up the track, a detent at the low end of the track separate from the carriage to engage and hold the latter, a load-holding device on the carriage movable to its holding position by gravity, and an inclined fixed abutment to trip said device from its holding position as the carriage descends.

778,590. CENTRIFUGAL DREDGING-PUMP.—Carl Lager, Baldwinsville, N. Y. In a centrifugal dredging-pump, an outer shell composed of sections and an inner lining smaller in its outer dimensions than the interior of the shell and having a limited adjustment in the shell, and means to effect such adjustment from the exterior of the shell.

778,608. AUTOMATIC AIR-COMPRESSOR.—John Rogers, Bridgeport, Conn. An air-compressor comprising a cylinder having induction and eduction pipes and valves in said pipes, a pivoted lever to whose opposite ends said valves are connected so that they will open and close alternately, an outgoing air-pipe provided with a valve, an air-inlet pipe provided with a valve, a rod extending upward from the lever and offset near its lower end, having a free upper end provided with a head and a float moving freely on said rod, the float rising on the rod as water rises in the cylinder and by engagement with the head raising the rod, tilting the lever and simultaneously opening the eduction-valve and closing the induction-valve, and said float falling with the water and closing the eduction-valve and again opening the induction-valve, said action being continuous so long as the water-supply continues.

778,614. GAS-PRODUCER.—Samuel T. Wellman, Charles H. Wellman, and John W. Seaver, Cleveland, Ohio, assignors to the Wellman-Seaver Engineering Company, Cleveland, Ohio. The combination in a gas-producer, of hollow stirring or agitating arms, a rotating element of the producer carrying the same and having a partition whereby it is divided into two chambers one of which communicates with said hollow arms, pipes projecting into the hollow arms and communicating with the other of said chambers, and means for supplying water to one of said chambers and conveying it from the other.

778,634. DREDGE.—William A. Collins, Bloomfield, N. J. In a dredge or the like, the combination with a boom, a dipper and a dipper-handle, of an operating chain secured to the dipper, means for operating said chain and a member bearing on the operating-chain and adapted to regulate the working angle thereof.

778,677. STEAM-SHOVEL OR THE LIKE.—George W. King, Harry J. Barnhart, and Charles B. King, Marion, Ohio, assignors to the Marion Steam Shovel Company, Marion, Ohio. In a steam-shovel or the like, the combination, with a car having a boiler mounted thereon and provided with a firing-space between the boiler-furnace and the rear end of the car, of a coal-box pivoted at its forward edge to the rear end of the car so as to be swung forward to rest on the car within the firing-space when not in use, said box extending rearward beyond the end of the car when in use, and means for supporting said box in this latter position.

778,747. APPARATUS FOR SEPARATING SULPHIDES FROM THEIR ORES.—James H. Gillies, Melbourne, Victoria, Australia. An apparatus for separating sulphides from ores comprising a treatment pan or vessel, means for heating the same, means for conveying a supply of cool or cold liquid to the bottom of said pan, and means for permitting said liquid to escape from the bottom of the pan to carry away the drossy matter without lowering the temperature or the level of the heated liquid in the upper part of said treatment pan or vessel.

778,781. ARTIFICIAL FUEL AND PROCESS OF MAKING SAME.—George W. Herbein, San Francisco, Cal. A process of making artificial fuel which consists in mixing with petroleum a fatty acid and an alkali, partially saponifying said mixture, and adding to said partially saponified mixture alkaline peat in the form of charcoal.

778,789. METHOD OF PREPARING METALLIC MIXTURES FOR PRINTERS' TYPES, BEARINGS, ETC.—Charles A. Meadows, Yonkers, N. Y., assignor to United States Alloy Company, Jersey City, N. J. A method of making metallic mixtures for casting, which consists in mixing the constituent metals in the molten state, forming the resultant product into small solid pieces or bits, and thoroughly commingling the pieces or bits, whereby the constituent metals are distributed with substantial uniformity throughout the mass.

778,827. POKER FOR GAS-PRODUCERS.—William B. Hughes, Wissahickon, Pa. A poker comprising a hollow stoking-bar, hollow trunnions connected therewith, and a cap having passages connected with the interior of said bar and trunnions.

GREAT BRITAIN.

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy:

Week Ending December 17, 1904.

24,924 of 1903. MANGANESE SILICON ALLOY.—La Neo-Metallurgie, Paris, France. Producing in an electric furnace a compound or alloy containing from 50 to 90% of manganese and from 10 to 50% of silicon very free from carbon, sulphur and phosphorus.

25,569 of 1903. ROCK-DRILL FEED. J. T. Blaokett, Ginsborough. In rock drills, mechanism for arresting the feed when the drill meets extra hard rock or other obstruction.

755 of 1904. USING IRON BORINGS.—W. J. Foster, Walsall. Method of injecting iron borings and turnings along with the blast in blast furnaces.

831 of 1904. BALL MILL.—W. Kitto, London. In ball pulverizers in which the balls move in a circular horizontal groove, the provision of buffer springs to give a certain amount of freedom to the rotating parts.

1,340 of 1904. ROCK-DRILL VALVE.—C. Walton and G. H. Rayner, Sheffield. Improved method of governing the movement of the air valve in rock drills.

6,945 of 1904. BRONZE ALLOY.—A. Jacobsen, Hamburg. An alloy of iron, nickel, copper and aluminum for making a bronze of great tensile strength.

21,766 of 1904. SAVING TANTALUM.—Siemens & Halske, Berlin, Germany. Purifying tantalum from oxide by vaporizing in an electric furnace.

21,809 of 1904. LOCK FOR MINERS' LAMPS.—L. N. Williams, Aberdare. Improvements in electric magnetic locks for miners' safety lamps.

The deepest metal-mining shaft in the world is Tamarack No. 3, which has attained a vertical depth of 5,027 feet. No. 2 shaft, of the same mine, is 4,320 ft. deep and No. 5, 4,955 feet.

The addition of manganese ore in large quantity (4 per cent) to cast iron will prevent the sulphur of the coke from uniting with the iron; but it will not remove any of the sulphur which was originally in the raw pig. This method is quite expensive, the sulphur control already being well effected by a suitable amount of limestone.

New York Antimony Market.

During the year under review values have, as usual, ruled within narrow limits, with the exception of the last few months, when the shortage of supplies, caused by the Russo-Japanese war, resulted in quite a sharp upward movement. Imports of regulus during 1904 shows a falling off of about 900 tons, and that of ore about 300 tons.

The year opened with Cookson's antimony selling at 6¾ to 7c.; Hallett's at 6 to 6¼; U. S., Japanese, French, Hungarian and Italian at 5½ to 5⅝c. During February a somewhat firmer tone developed, owing to the fact that it was expected, in case of war between Russia and Japan, that shipments from the latter country would be interfered with. When hostilities actually broke out, strong efforts were made to raise prices, and at the beginning of March values had improved about 1c. a pound. Consumers, however, remained rather apathetic, and prices crumbled away from month to month, until, at the end of September, they again reached the low level of the opening quotations of the year.

During the last week of October an attempt was made to corner the spot supplies in New York, which were comparatively small. Inasmuch as shipments from Japan had been very much restricted for some time past, owing to the war, these efforts were partially successful, and at the beginning of December prices had advanced to 8½ for Cookson's, 8¼ for Hallett's, and 8⅛ for the outside brands.

MONTHLY AVERAGE PRICES OF ANTIMONY.

1904.	Cookson's.	Hallett's.	Other brands.
January	6.938	6.250	5.688
February	7.594	6.781	6.203
March	7.875	6.825	6.475
April	7.875	6.750	6.406
May	7.531	6.578	6.203
June	7.200	6.438	5.961
July	7.188	6.485	5.969
August	7.188	6.688	6.062
September	6.913	6.537	6.015
October	6.984	6.578	6.172
November	7.592	7.328	7.204
December	8.388	8.160	8.088
Year	7.439	6.783	6.371

During the balance of the year the market ruled very quiet indeed, the closing quotations being given as 8¼@8½c. for Cookson's, 8@8¼c. for Hallett's, 8@8⅛c. for U. S. Japanese, Italian and Hungarian. These prices are for retail lots; larger quantities could be had at quite a concession.

It takes time to be polite; but time costs money. All the more reason, therefore, that a strenuous age should bethink itself.

Bars of gold bullion from cyanidation can be 'toughened' by fusion and stirring with sodium nitrate; this oxidizes and dissolves out traces of lead, zinc, copper, etc., and should be repeated till the slag comes off colorless. The cost is said to be about one-third of a cent per ounce.

The London Lead Market in 1904.

By Our Special Correspondent.

January commenced with a good trade doing, especially for forward delivery, £11 10s. being the price for soft foreign, and after a temporary setback, owing to the sales of newly arrived parcels, values improved to £11 15s., and a large business was done at this level, the market being kept firm by fears of labor troubles in Spain. Towards the end of the month the large arrivals, coming at a time when all consumers were well covered, caused a setback in values, so that the close was dull at about the opening level.

February also felt the pressure of heavy arrivals, causing a decline to £11 5s., but buyers soon came in and bid for forward metal, causing a reaction to £11 18s. 9d. Slight fluctuations then took place during the remainder of the month, but the closing price was firm at about £11 15s.

March saw an active business doing, and a good consumers' demand for near stuff put the market up to £12 7s. 6d., from which level it eventually set back, and closed at £12 2s. 6d. to £12 5s. The market was strong throughout, owing to good buying and a scarcity of sellers.

April witnessed free buying of lead by consumers at about £12 10s., and whenever there were signs of weakness large orders were received on behalf of bankers, who were acting under orders for American account, the selling meantime being principally from Continental dealers. Towards the end of the month this caused a reaction to about £12 7s. 6d.

When May came in the market quickly fell away to £11 18s. 9d., owing to renewed large sales on Continental account, and this was continued throughout the month, consumers being frightened away by the free selling, so that there was a further break in prices, and values dropped to £11 10s.

The beginning of June found a little speculative interest being taken in the market, which helped prices to rally to about £11 15s., but the arrivals were heavy, much of the material being put into warehouse, as buyers could not be found to take stuff for prompt delivery, so that sales were made down to £11 6s. 3d. for cash. Consumers showed a very reserved attitude throughout, and only bought in a half-hearted manner, and, the building trade being slack, gave them no encouragement to buy ahead in an apparently declining market.

July commenced with a little better tone, the nearest value being £11 10s., and when it was seen that some good speculative orders were in the market, prices were bid up to £11 15s., which level was maintained during the remainder of the month, consumers showing more disposition to buy, when the market gave signs of improvement.

August saw a very steady market, with the widest fluctuations amounting to no more than 5s. per ton, an active business being consummated both in London and in the provinces. Producers and dealers also were firmer in their views, so that when September came in and large orders were being placed by the Continent for electrical work, prices were well maintained, and at times improved to £11 18s. 9d.; realizations of speculative holdings and sales of warehouse material preventing the market from going to a still higher level.

Heavy buying for Russian account was the chief feature in October, and was mainly responsible for the market advancing to about £12 7s. 6d. The demand was entirely for early delivery, with a view to shipment being made by the ports before the close of navigation. When the demand ceased, there was a strong buying movement by speculators, who throughout November bought largely, causing prices to improve to £13 2s. 6d. On the resale of some of these purchases, prices fell away until £12 16s. 3d. was reached, eventually closing at about this figure to 2s. 6d. advance. English consumers, having bought freely, did not follow the advance to the highest level.

December as usual saw a setback in value, the coming holidays and usual slackness in the building and allied trades having the effect of keeping buyers off the market. The support which had been given to the market by prominent dealers was also withdrawn, so that prices gradually declined to about £12 11s. 3d. per ton. From this low level there was a steady recovery, culminating in a quotation of £12 17s. 6d. to £12 18s. 9d. for Spanish lead, and £13 to £13 1s. 3d. for English lead. These were the closing prices of the year.

London Spelter Market in 1904.

By Our Special Correspondent.

During the year under review, the market has exhibited considerable strength, and prices show a notable improvement. At the opening of the year stocks in the hands of producers were practically nil, and a very good demand on the part of our galvanizers met with small offerings from dealers. Consumers had allowed their stocks to run very low, and spot metal fetched a premium; the position was further aggravated by the fact that shipments from works were much interfered with by severe weather. With small fluctuations prices remained round £21 10s. to £21 15s., ex ship, London.

In February strong efforts were made by Continental dealers to depress values, but in view of the scarcity of the metal, this was of little avail, so that a higher range of prices was established during March, which enabled producers to sell considerable lines for forward delivery. The metal was chiefly taken up by Continental consumers, who showed more willingness to cover their requirements than home consumers. At that period a heavy demand set in for sheet zinc, partly for home consumption, partly for export to Russia and Asia.

The following month witnessed a further improvement. Dealers withdrew their cheap offers of forward delivery, and £22 10s. was paid for prompt shipment, while June sold at £22 5s.

In May some dealers pressed on the London market, evidently in anticipation of exports of American spelter, and July sold at £22, while August changed hands at £21 10s. Producers were not disturbed by these sales, but business with consumers was considerably interfered with, and the close of May was at £21 17s. 6d. to £22.

During the following month producers began to feel the dearth of orders, and showed more anxiety to meet buyers' views.

At the opening of August £22 2s. 6d. was generally quoted in London, but values were quickly lifted up to £22 15s.

During September the improvement was fully maintained, and up to £22 17s. 6d. was paid. Early in this month it became known that about 5,000 tons of American spelter had been bought. Consumers became frightened by that news, and producers also grew somewhat nervous, not knowing to what extent exports from America would take place. Dealers used the opportunity of making a new onslaught, and succeeded in causing a relapse to £22 5s.

In October, however, consumers were attracted by the lower level, and the real strength of the market was again revealed, prices rising under bear covering, and large buying, closing at £23 12s. 6d.; a rise of nearly 30s. during this month. The galvanizing trade expanded further, important inquiries being received from Australia and notably from South America, and, in spite of American arrivals, the situation was not relieved. Early delivery commanded a premium, and producers, having sold previously for months ahead, were unable to make any reasonable offers.

The largest business during the year was put through towards the middle of November, and up to £25 5s. was paid in London by dealers who were caught short. Galvanizers had at last begun to recognize the real position of the article, and had now no hesitation in buying for the first few months of 1905. Their buying was accompanied by transactions on the Continent between producers and dealers, which extended right into the middle of 1905. China and Japan also bought good lines of spelter, which was quite a new feature.

When consumers were satisfied for the time being, a reaction set in, and trade became quieter. The demand subsided, partly in view of stock-taking and holidays, but the year closes with a healthy outlook for 1905.

The final prices were £25 5s. to £25 10s. for good ordinary brands, and £25 10s. to £25 15s. for special brands.

Special Correspondence.

San Francisco Jan. 4.

Throughout the northern and central part of California, in the drainage basin of the Sacramento and San Joaquin rivers, a petition is being circulated asking Congress to pass the Gillet bill, which amends the Caminetti law so that small hydraulic claims, remote from navigable streams, shall be relieved from the burdens now placed upon them. The so-called Caminetti law with regard to mining by hydraulic process applies to only certain portions of California and requires the operator to build a dam according to specification, or with the approval of the California Débris Commission in all cases, whether the dam be necessary to restrain possible débris or not. This requirement prevents many men of small means from operating their claims, notwithstanding the fact that these claims may be remote from navigable streams, although located on the watershed. Many small mines could be profitably worked without any damage whatever to others, or to the streams, but the present laws will not permit this. In Sierra and Plumas counties particularly, these small mines are numerous. Their owners are financially unable to build dams. The Gillet bill provides that none of these mines many be worked without permission of the California Débris Commission, but it relieves the officials of the duty of requiring a dam, when, in their opinion, none is necessary.

The new restraining barrier, dam, or débris, of the Omega Mining Co. at Omega, Nevada county, has "gone out." It was built on the crib system of logs and rocks and was pronounced by agents of the California Débris Commission as one of the best of its kind in the State. The company was almost ready to begin hydraulicking its ground under a government license. The dam was built to restrain the débris in accordance with the requirements of the Caminetti law.

The Union Water Co., one of the oldest ditch companies in California, has gone out of existence by the expiration of its term of incorporation. The Utica Mining Co. now owns two-thirds of the stock and the Hobart estate one-third. The company supplied water to the southeastern part of Calaveras county, owning an extensive system of ditches and reservoirs extending to Silver valley, 30 miles above the Big Trees, and covering the north fork of the Stanislaus river and its tributaries. Its main ditch carries about 5,000 miners' inches of water and its first subdivision takes place at the head of Peppermint creek, about six miles from Murphy's. From that point the ditch is divided, furnishing water to the fine electric plant of the Utica company at Murphy's, the town of Murphy's, Douglas Flat, Vallecito and the adjacent mining and agricultural territory, Angel's and Robinson's Ferry. On the other side it takes water to French gulch, Dogtown and Altaville. There will be no change of management, but the name will now disappear.

The three engineers employed by the Commissioner of Public Works to consider the control of the floods of the Sacramento river and its tributaries have filed their report concerning which there is much discussion. While they did not lay the whole blame on the past damages to hydraulic mining, they consider it the main cause of the shoaling of the river and the resultant floods. In offering a remedy the basic principle of the plan suggested is concentration, in order that channel improvement may be secured, and the means by which concentration is to be obtained consists, in large part, of levee construction. Not only is the Sacramento river, throughout its course from Stony Creek to Collinsville, to be leveed, but also the Feather, Yuba, Bear and American rivers and other tributaries are to be so treated. Even the small creeks are to be lined with levees, and the hill drainage is to be collected and carried off in canals. Through the great basins there are to extend waterways for drainage, and during the period when the channel improvements will operate as by-passes to receive and carry away the spill from the river. An essential feature of the project is cutting off bends and straightening the river between the mouth of the Feather and the city of Colusa, it being proposed to reduce the present length of this part of the stream, which is almost 70 miles, to 47 miles. In order to increase the scour of the river in its lower reaches, it is proposed to close the sloughs through which a part of the discharge now enters the San Joaquin. The estimate of cost is $23,776,022, which practically settles it, though the lands protected would be valued at from $50,000,000 to $75,000,000. The Legislature is to "wrestle" with the subject, and the government is to be asked to assist, but like several previous reports on the subject this one will probably be shelved without definite action.

A projected electric line that will materially assist a mining section is that from Jamestown, Tuolumne county, to Mariposa and thence to the Yosemite valley. The distance between the two towns is about 40 miles, and 35 miles extension will bring the road to the valley. The incorporators of the new company are: I. B. Bullock, S. D. Freshman, S. H. Smith, C. N. Hamblin and W. C. Potts. S. D. Woods is the attorney for the company. The road is designed to reach the mining region around Jamestown and the miscellaneous traffic between that place and Mariposa. The preliminary surveys have already been made, and the final surveys will be made at once. This Jamestown & Yosemite railroad will virtually constitute an extension of the Sierra railroad, with which it will connect at Jamestown.

The Kern River Power Co. has complied with the wishes of the irrigation men and thus stopped the legal proceedings, by agreeing to return the water to the river channel undiminished in quantity. To meet this requirement it was necessary to cement each ditch for the full distance of 12 miles. This work has now been completed. The water can be used for generating power and yet its original volume be returned to the river for use by the irrigating interests of the valley. The power generated by the Kern river plant will be utilized largely by the street car lines of Los Angeles. The cement manufacturers profited by the plan of cementing the ditches.

Work has been begun a mile and a half above Lewiston, Trinity county, driving an 8 by 12 tunnel a third of a mile long in order to divert the Trinity river so that a mile and a half of its bed may be mined. The river is to be carried through the tunnel at stages of low water, so the big bend may be mined. Preliminary prospecting operations have satisfied Frank McCue and associates that the gravel in the river bed carries much gold.

The New Idria Quicksilver Mining Co. of San Benito county is about to try the experiment of using crude petroleum in roasting its ore. If the experiments are successful teams will haul the oil from Coalinga, Fresno county, a distance of 35 miles.

Denver Jan. 7.

Alva Adams will be inaugurated governor on January 10. He is declared to have been elected by a plurality of 9,774 votes. There is no anticipation of a renewal of labor troubles.

During the month of December the Cripple Creek district produced nearly 66,000 tons of ore, valued at $2,250,000, and the record of Gilpin county for 1904 was broken, the total shipments from Blackhawk station for the month of December being 310 cars, or 6,500 tons of crude ore, tailing and concentrate.

Orders were received here this week from the Director of the Mint at Washington, to discontinue the shipping of the bullion deposits to Philadelphia, and Frank M. Downer, superintendent of the Denver branch mint, will now begin to store this, in order that coinage operations may begin on July 1.

For some time past experiments have been made at the Pueblo plant at Pueblo, with the Huntington-Heberlein converter, which was originally invented in Europe but has been especially successful in Australia, and the results have been so satisfactory that the American Smelting & Refining Co. has ordered a number of them to be manufactured, to be placed in its different plants.

The Colorado & Northwestern railroad has completed its Eldora branch, an extension from Sunset to that point, 16 miles long, and the first passenger train ran over it a few days ago.

Probably for the first time, an entire metallurgical plant has been leased by an educational institution, for the benefit of its students. The Bonnevie & Lee plant in this city, operating under the name of the Denver Ore Testing & Sampling Co., has been operated by the students of the State School of Mines this week under the direction of F. W. Traphagen and his assistants, and the experiment has thus far proven highly successful. As this test plant is very complete in its appliances for cyaniding, chlorination, amalgamation, concentration and other metallurgical processes, for the extraction of ore values, these can all be practically demonstrated there.

Houghton Jan. 7.

The results secured by the Bohemian Range Copper Co. are reported to surpass the expectations of those who undertook this work. The property, consisting of 960 acres, lies four and one-half miles east of the Phoenix. The shaft has attained a depth of about 20 ft. on one of the four parallel amygdaloid beds, and is showing very encouraging copper.

The Phoenix is operating at present with only one shaft, the west vein having been discontinued some time ago on account of the unprofitable character of the copper rock produced. The present active shaft is sunk in the St. Clair fissure vein, being inclined to a degree conforming with the dip of the amygdaloid beds through which the fissure gashes. This incline also conforms to the dip of the Greenstone formation, which is superimposed upon the amygdaloidal series, and the shaft extends under the Greenstone. It is now projected that a vertical shaft shall be sunk from a point beyond the Greenstone stratum through which the lower work-

ings in the St. Clair vein may be wrought. Such a shaft would bring the central surface plant to a position considerably closer to the stamp mill. The results of operations in the St. Clair are reported to be very satisfactory.

The unwatering of the Miskwabik shaft has been completed and sinking and drifting have been resumed. No unusual developments are yet noticeable.

The installation of the permanent hoisting engine for No. 1 shaft at the Mohawk is completed and the machinery has been in operation for a month. Energy is now concentrated on the completion of No. 2 hoisting engine and it will be ready for service early in February. The temporary hoisting engine formerly in service is being transferred to No. 5, the new opening at the south end of the mine. A railroad spur has been extended to No. 5 and a temporary rockhouse is under construction. All copper rock secured from sinking and drifting in this opening will be shipped directly to the mill. Sinking has been suspended while the surface equipment is being completed.

The Ahmeek No. 1 shaft has attained a depth of 588 ft., which represents the fourth level, the first level being 213 ft. from surface and the lifts 125 ft. each. The first level drifts have been extended south 200 ft. and north 500 ft. from No. 1 shaft. The showing of copper rock in all of the openings maintains the excellent average which has characterized this shaft from the beginning. No. 2 shaft is approaching a depth of 400 ft. It is not in as rich ground as No. 1, but is quite up to the Kearsarge lode average.

The Allouez has attained a depth of 1,294 ft. in its No. 1 shaft, bringing it within 100 ft. of the Kearsarge lode, which is being sunk to intersect. A plat is being cut at the present depth for the purpose of driving a crosscut to intersect the lode—in a lateral course. Another crosscut will be driven from a point 50 ft. below the present level.

A railroad survey is being run from the Mohawk mine, which is the outermost railroad extension in Keweenaw county. This survey extends through the Gratiot valley and thence northeast along the mineral belt toward the extremity of Keweenaw peninsula. There is an amount of exploratory work in hand along the course of this survey and apparently the construction of a railroad would be justified. The probability of it being undertaken next summer is quite favorable.

The Challenge, which is being developed a few miles south of the Champion by the St. Mary's Mineral Land Co., has bottomed its vertical exploratory shaft on the rock after penetrating 114 ft. of wet sand. The work has been in hand since September 14. Many boulders of a size too large for hoisting had to be blasted, and the undertaking was an extremely difficult one. From data secured through diamond drill operations several years ago it is calculated that the shaft is bottomed on the hanging wall side of a copper bearing formation, which is believed to be the Baltic lode. The shaft will be continued vertically for a reasonable distance, and it is probable that the lode will be intersected. If it is not discovered within probably 100 ft. of vertical sinking, crosscutting will be started. The shaft was "dropped" for 100 ft., and at that depth it was "hung up" and "lathed" for the remainder of the distance.

An accident to the hoisting engine at "D" shaft at the Atlantic caused a suspension of rock shipments from that mine during the last week of December.

Salt Lake City. Jan. 6.

The war between the farmers of the Salt Lake valley and the several smelting companies is on in earnest. A number of suits have been filed in the courts, both State and Federal, and, within the next few days, the county commissioners of Salt Lake county will be petitioned by the farmers, who complain that their farms have been devastated of vegetation by the smelter smoke and fumes, to have the smelters declared a nuisance. Among the suits filed in the Federal court is one brought by Reece Bros., leasers of the Mormon Church farm, who claim damages to the amount of $20,600. The American Smelting & Refining Co., United States Mining Co., Utah Consolidated Mining Co., and the Bingham Consolidated Mining Co. are named as defendants.

At a meeting of the directors of the Galena Mining Co., held this date, the contract entered into by the directors of the company for the sale of the corporation's property at Fish Springs, Utah, for $20,000, was ratified. The purchaser is the Utah mine, which corporation has operated an adjoining property for a number of years.

According to the report issued by sampling mills the shipments made by Park City mines during the year 1904, aggregated 276,665,000 lb. Of this the Daly-West sent out 129,815,000; Silver King, 121,570,000; Ontario, 13,057,000; Woodside, 349,000; Crescent, 312,000; New York Bonanza, 246,000; sundry mines, 2,696,000.

The Wabash Mining Co., operating at Park City, will soon be in the market for a large compressor plant. Col. N. Treweek, of Salt Lake, is manager.

The Bullion-Beck & Champion Mining Co. has brought suit against the Eureka-Hill Mining Co., both Tintic operators, on the grounds of alleged trespass. The companies involved had difficulty over the apex question as far back as 1886 and the litigation ended in favor of the Eureka-Hill. Subsequently, numerous suits were brought and, finally, the managers of the companies agreed on certain boundary lines between their respective properties. The plaintiff claims that the defendant has disregarded the agreement and has extracted ore unlawfully. Damages to the extent of $216,000 is asked for.

The tunnel through which the ores of the Cactus mine will go to the reduction works at Newhouse has been completed, connections having been made on January 3. The adit is 5,980 ft. long and will be equipped with electric haulage.

Gomer Thomas, State coal mine inspector, has filed his report for the year 1904, which shows a shrinkage in the coal output of the State as compared to the previous year, which, he explains, was due to the labor troubles in the several camps. Fully two-thirds of the men employed since, he states, never had previous experience in the mines. The production of the year amounted to 1,563,274 short tons, of the estimated value of $2,345,061. The decrease from 1903 was 185,001 short tons. There were employed in the coal mines 2,215 persons and the average amount of coal mined by each man was 705 tons. There were four fatalities to each 1,000 employed, while the amount of coal mined against each life lost was black and 70,009 lb. of giant powder was 173,697 tons. A total of 207,254 lb. of used. The inspector recommends that the legislature amend the coal and hydro-carbon laws to prohibit the taking of explosive oil into coal mines.

Announcement has been made of the formation—under Maine laws—of the Nevada-Utah Mines & Smelters Corporation with a capital of $15,000,000, divided into 1,500,000 shares. The basis for the organization is the property of the Pioche Consolidated and other properties at Pioche, Nevada; the Montreal, Comet and Imperial copper properties in Beaver county and the Last Chance copper mine at Bingham. The officers of the company are: President and general manager, John Weir, of New York; vice-president, Edward F. Cragin, of New York; treasurer, Heman Doud, of New York; secretary, C. J. Caughey, of New York; directors, A. B. Lewis and W. S. McCornick, of Salt Lake, Utah; Edward F. Freudenthal, Pioche, Nevada; Charles J. Dodge, of Michigan.

The output of the mines of Tintic during the year 1904 amounted to 6,157 carloads of ore; 21 carloads of concentrate and 42 bars of bullion.

Spokane. Jan. 6.

The Oregon Smelting & Refining Co., operating the Sumpter copper smelter, has elected officers as follows: President, W. E. Lindsley; first vice-president, Walter A. Wood; second vice-president, William Coverly; treasurer, E. J. Lindsay; secretary, Wm. S. Nichols. The company was organized in 1902, with a nominal capital of $600,000, of which less than $400,000 has been issued. The plant has been completed for over a year, but only one shift has been running.

The Badger mine, controlled by the interests represented by Fred Bradley, of San Francisco, has closed for the winter. The same interests own the Bull of the Woods, in Grant county, eastern Oregon. The freezing of the water made it impossible to operate both properties, which are supplied with power from one plant. It was decided to continue the Bull of the Woods, since it is in better shape for shipping with economy.

Mining operations on the Upper St. Joe, Ida., are more active than usual this year. At the Manhattan, six miles above the head of navigation, on Mineral creek, a double shift is at work on a tunnel which is in 200 ft., and will be continued 160 ft. to cut the lode. All the miners take stock for pay.

The reorganization of the Rambler-Cariboo company, with an increased capital of $500,000, which will make the total issue $1,750,000, is being planned. The property, which is a silver-lead producer in the Slocan district of British Columbia, with its chief stockholders here, is driving a 4,500-ft. tunnel to tap the lode. The company is about out of funds. It is planned to issue the new stock at 12½ cents a share, and stockholders under the present organization can subscribe pro rata for the new issue.

Superintendent Smith, of the Queen of West, near Cornucopia, Ore., announces that between $50,000 and $75,000 will be spent this year in development and equipment. A milling and concentrating plant has been ordered for early spring delivery. This is in addition to the 10-stamp mill now in operation.

The White Swan mine, in eastern Oregon, made notorious by Letson Balliett, is to be reopened this spring, according to Manager Stuller.

The Highland, a neighbor of the Maxwell, in Rock creek camp, eastern Oregon, is being equipped with a plant to handle 50 to 70 tons daily. Work has been under way for a month, and the carpenters are busy.

A five-stamp mill is being built by Zoeth Hauser on the Dixie mine, at Quartzburg.

The Kearns-Montana Coal Co., holding two square miles of coal in the Nicola fields of British Columbia, has elected officers here as follows: President, James John W. Hill; vice-president, John F. Firch; secretary-treasurer, J. L. Mercer; assistant treasurer and secretary, Thomas C. Bowden, of Butte.

Cutler T. Porter, of Spokane, has gone to Republic, Wash., to do assessment work on the Golden Lion Little Four Mining Company.

Duluth. Jan. 7.

The negotiations of the Atikokan Iron Co., with Mackenzie & Mann and others, have been closed and a development of much importance to the province of Ontario is reasonably well assured therefrom. The Atikokan Iron Co. is a property owned by the Messrs. Hunter, of Duluth, and Messrs. McKellar and others, of Ontario, and the negotiations have been under charge of James C. Hunter, of Duluth, manager of the American Exchange Bank of that city. Mackenzie & Mann are operators of the Canadian Northern road, which runs within a few miles of the Atikokan range. Through this deal the road will build in to the range, an ore dock will be erected at Port Arthur, and a furnace built there. The municipality has granted exemption from taxation for 20 years, the citizens have given a location on deep water, and have agreed to subscribe for $200,000 in bonds, and the company agrees to erect and maintain a large coke furnace. The Atikokan ores are magnetitites, carrying some sulphur, which is supposed to be largely in the walls, and are very low in phosphorus. There is probably a large tonnage, and work that has been done in exploration at various times has shown more than 10,000,000 tons. At one time the American Steel & Wire Co. had an option on these properties, but by reason of the purchase of the company by the United States Steel it was dropped for the time being, and was never renewed.

Butte. Jan. 6.

The Watseca Mining Co., which has been mining and milling gold ore in the Rochester district, 40 miles south of Butte, during the last three or four years, will close its mines and mills on January 15. This information was given out by Carlton Hand, manager of the property, last night. Mr. Hand refused to say why the company would suspend operations, but intimated that the shut-down would be for only three months. The company is composed of Montana and Utah men, A. W. McCune, one of the principal owners of the Cerro de Pasco property, in Peru, being the heaviest holder of shares. Mr. Hand is also a stockholder. The company owns two mills, one of which is practically new, having been built about a year ago, and several mines, the deepest workings of which are 750 ft. It has been operating only one mill during the last few months. The lower workings of the mines are quite wet, the company being required to pump more than 1,000,000 gal. of water every 24 hours. The pumps are to be pulled and the workings permitted to fill with water to the 300, which is about the water level.

The Blackrock company has unwatered the workings of the Blackrock mine, of Butte, and is preparing to work the property on an extensive scale. It has made several shipments of silver-gold ore from the upper levels.

Development work on the Niagara, a silver-gold producer of Butte, is progressing rapidly, and ore is being shipped at intervals. This mine is one on which work was suspended when the price of silver dropped so low in 1893. It has a bright future.

The Old Glory company, operating the Old Glory mine, in the copper belt, is extracting 40 tons of copper-silver ore per day from its lower workings and shipping it to the Washoe sampler.

The Raven company has increased its output of copper-silver ore recently, the quantity now aggregating about 120 tons per week, double that formerly mined.

United Copper has reduced its working force 250 men, but is mining nearly as much ore as it did prior to the reduction. Its daily output is 1,200 tons.

The Colorado company, one of the subsidiaries of the Amalgamated, will commence sinking its main shaft from the 1,800 to the 2,000-ft. level next week. When the work is finished the company will have immense ore reserves. Since the resumption of work on this property, six weeks ago, the force has been increased gradually, and now comprises 350 men. The output is 400 tons of copper-silver ore per day.

At the Goldsmith mine, a mile northwest of Butte, C. W. Ellingwood is driving for a shoot of ore from which he mined 3,000 tons in the upper levels last year. The Goldsmith is one of the rich silver mines in the district, which is evidenced by the fact that the 3,000 tons yielded $200,000. The property is owned by the George Tong estate, and from the $200,000 Mrs. Tong received $98,975 royalty.

The Southern Cross company, operating the Southern Cross gold mine, 50 miles west of Butte, expects to have its new 60-ton concentrator at work about the middle of the month. The ore of this mine has been going to the Washoe smelter, in Anaconda, a haul of 17 miles by wagon.

Bisbee. Jan. 5.

Since the resumption of pumping at the Calumet & Pittsburg shaft the water has not been coming in as fast as before the pumps closed down. The flow is very much less and sinking will be increased materially, if no new large vugs are opened into. The value of this property has not materially changed for a year, and is ranging at about $4,000,000, according to the sales of its shares. There is really no increased valuation in the mine since a year ago, or even since two years ago, except for the cost of pumps and machinery that have been installed in that period. But there is a very settled conviction that Canadian & Pacific is sure to be a large mine, and the steadiness with which its stock values hold above $4,000,000 is an indication of what the large stockholders think. Unless all indications are wrong this will make one of the biggest copper mines ever opened, and in a short time it is expected that developments on the 1,100-ft. level, which will now soon be reached, will be of the most important nature. This is the level for which the company started from the first, and was only turned aside from pushing for it by the enormous volume of water encountered below the 9th level.

Rich ore has been cut in Carlton tunnel of the Lake Superior & Arizona. This was almost immediately after a report from the mine of the particularly poor showing in this tunnel. In the shaft of this mine about 400 gallons of water are coming in per minute. The company is using nitro-gelatine for blasting and is finding it very satisfactory.

The Lucksure mine, half a mile from the Tombstone Consolidated, is sinking on a lime silver vein and is opening a good property so far as can be seen.

Negotiations are under way for the sale of the Bunker Hill property, near Tombstone, to an Eastern syndicate that proposes to develop.

It is a trifle curious that while the Michigan stockholders of the Mitchell Development Co. are busily engaged in discussing whether they shall continue their developments or not, the owners of the properties the company has had under bond are all carrying on their own assessment work for the year. The company gave notice some time ago that it would not carry out the assessment work then due, and this was taken by owners as notice that it elected abandon, and they began work on their own hook, and consider themselves free to make such new deals as they like. It is probable that if the Mitchell company wants to resume it will have to make a new arrangement all around.

The pumps at Tombstone Consolidated are steadily overcoming the water which is now below the 500-ft. level. It has been coming out at the rate of 3,500,000 gallons a day. The ground that has been abandoned for years is now slowly being won back and development can commence on the lower levels in due time.

New furnaces will be in operation in Copper Queen smelter at Douglas in a very short time, and the production for February will probably considerably exceed that of any previous month in the history of the camp.

A large amount of assessment work is under way in properties about here that have not yet become mining explorations. In almost every case this work is being done in a way to make it part of permanent improvement, whenever such is started. This is different from much assessment of the past, and indicates the changed and better condition of the camp. It is probable that several of these groups will be developed in a permanent way this year.

Titles to the entire group of properties of the Bisbee Queen have finally been adjusted, and it is expected that the ground will be prospected this year on a considerable scale. It is understood that offers have already been made on these claims.

Dawson. Dec. 31.

Yukon.—Mr. Breese, of New York, who is investing heavily in a hydraulic undertaking in the Alsek district, stated recently, in an interview, that the diggings, thanks to the Dominion government which had provided good roads, were easily reached, and in this respect had the advantage of many other new mining districts. At the present time the field is practically deserted, there being perhaps about 25 men engaged in prospecting and proving the depth of the gravel. Mr. Breese stated that few individual miners had done better than to earn wages from working claims, and that he, himself, had abandoned his holdings except those on Bullion creek, the claims there and on Ruby creek, up as far as discovery, alone promising well. No decision could yet be reached with regard to values at the new Burwash creek discoveries, as relatively little prospecting had been done. After spending a year in the district, Mr. Breese purposes to expend $300,000 in hydraulicing on Bullion creek, where from tests the ground has been found to contain values of 35 cents to two and a half ounces to the yard.

Toronto Jan. 5.

T. B. Caldwell, one of the owners of the iron deposit at Temagami, was in Toronto recently. He states that drilling operations have been temporarily suspended, the drill having struck a cavity from which a flow of artesian water came up through the bore hole. A quantity of loose gravelly material was also encountered, and operations have ceased until these difficulties can be overcome.

The Ontario government is being asked to construct a winter road from Bonheur station to Sturgeon lake, a distance of 30 miles, to give access to the gold mines at the latter point, as, owing to the insufficiency of present means of communication, there is a danger of the miners being cut off from their source of supply.

The Algoma Copper Range Co. is seeking incorporation in order to construct a line from a point on Batchwaung bay, Algoma district, easterly to the Suspension Copper mines, and thence easterly 50 miles to Aubrey falls. They also ask power to develop mineral lands and engage in mining and smelting.

The Wakefield Mica Co. is being wound up, Judge Anglin has dismissed an appeal of the liquidator, E. A. Learmouth, of Ottawa, to place on the list of those liable the names, of C. D. Chubbuck and K. B. Holland, of Ottawa, on the claim that $22,000 was due from the former and $2,000 from the latter. The judge thought the claims had been satisfied by their giving up mica properties owned by them. The names of J. S. King, Toronto, for $5,000, and C. A. Johnson, Toronto, for $8,000, were also removed from the list of contributories.

The coal shipments of Nova Scotia for 1904, from the six collieries having an output of over 100,000 tons, amount to 4,367,000 tons, the only increase being shown by the Nova Scotia Steel & Coal Co. The total output of coal is estimated at 4,650,000 tons. A three-year contract between the Dominion Coal Co. and the Provincial Workmen's Association representing their employees, went into effect on January 1. The contract fixes the scale of wages for the period covered, and stipulates that the mines shall provide a better quality of coal and do their own shearing and track-laying. The most important clause, however, is one binding the men to allow the company to dispose of its coal wherever it sees fit. The effect of this will be to enable the Dominion Coal Co. to fill contracts for other companies in the event of strikes, and to prevent sympathetic strikes. Similar propositions will be submitted to the employees of the other companies. The securing of this contract is regarded as specially important in view of the Dominion Coal Co.'s plans to find a market for its output in Ontario, as it will place it in a position to enter into long-term contracts and to negotiate on an assured basis with the Dominion government with this object.

J. E. Wilkinson and John McCart have sold their interests in 275 acres of oil property in the Petrolea district of Ontario, to New York capitalists.

E. Sterling Dean, claiming to be the owner of 1,500 shares in the Montreal & London Gold & Silver Development Co. has applied to the courts at Montreal for an injunction against that company and the Dufferin Gold Mining Co. He asks that a resolution of the former company transferring its capital stock to the Dufferin Gold Mining Co., be set aside as being prejudicial to his interests. The respondents have been granted six days to reply to the application.

Prof. Bergstroom, of the School of Mines, Kingston, has presented the Royal Astronomical Society with a model of the Shelburne meteorite that fell last August and is now in his possession.

Dr. Roughsedge, of Ottawa, has gone to Edmonton, N. W. T. He is interested in dredging for gold in the Saskatchewan river with a new patent appliance.

Robert Bell, of the Dominion Geological Survey, is this week attending the American Forestry Convention at Washington.

The following companies have been incorporated under the laws of the Province of Ontario:

The Reading Mining Co., Ltd., head office, Toronto, capital $250,000, provisional directors, Isaac Hollenbach, Thomas C. Seidle, Henry Kramer, and Percival Geisewite, all of Reading, Pa., and Henry J. Tharle, of Buffalo, N. Y.

Dorion Lead & Zinc Co., Ltd., head office, Port Arthur; capital, $50,000; provisional directors, Michael Jacoby, Herman J. Achenbach and Wm. H. Salter, all of Duluth, Minn.

Condensed Peat Fuel Co., Ltd., head office, Peterborough; capital, $40,000; provisional directors, Ernest V. Moore, Alfred L. Davis, David H. Moore, and Geo. M. Roger, all of Peterborough, and Walter A. Sadler, Toronto.

Western Salt Co., Ltd., head office, Mooretown; capital, $100,000; provisional directors, David A. Gordon, of Wallaceburg; Sidney C. McLouth and Norman A. Leach, both of Marine City, Mich., and Henry G. Jackson and Robt. C. Vaughan, of Toronto.

Nipissing Mining Co., Ltd., head office, Toronto; capital, $250,000; provisional directors, Ellis P. Earle, of New York; David Fasken and Harper Armstrong, Toronto.

Victoria Jan. 5.

Cariboo.—Verified returns of the season's operations of the Consolidated Cariboo Hydraulic, show that washing was carried on for 88 days, 16 hours, the value of gold recovered during that period being $85,936. The company proposes to install appliances for saving the flour gold, platinum, osmiridium and other valuable minerals at present lost.

Lardeau.—Recent development at the Triune mine in No. 3 tunnel, has exposed two new ore-shots of eight and four inches wide, respectively, carrying average values of approximately $135. There is now said to be sufficient ore in sight at the mine to justify the erection of a mill, while an aerial tramway will be installed in the spring. In the Poplar Creek section a settlement has been arrived at in respect to the adverse filed against the Great Northern mines, the owners of the Lucky Jack group, the contestants having received 75,000 of the company's shares, in consideration of the abandonment of the suit. Operations are to be resumed forthwith at the mine, for which a 20-stamp mill has been ordered.

Slocan.—The owners of the Lucky Jim mine have closed a contract with Batchelor Bros., of Spokane, to supply 1,200 tons of zinc ore and 800 tons of concentrate from that property. The ore carries 54 per cent zinc and the concentrate 48 per cent. During the year about 7,000 tons of zinc ore have been produced from the Slocan mines. It is, meanwhile, reported that the location of zinc smelting works at Frank, has been definitely decided, and that construction work is to begin at once. In the Slocan city division, Mr. Davys, formerly superintendent of the Silver King mine, at Nelson, has acquired a lease on, and commenced operations at the Emily Edith mine, owned by an English company on Four-Mile creek. The mine has not been worked for some years.

Nelson.—The London Hill company has issued a statement to shareholders, to the effect that an effort to raise additional capital having failed, the directors recommend that another lease on the property be granted. Negotiations in connection with the Ore Hill mine have been reopened; Minneapolis investors have undertaken to supply the necessary capital to place the property on a satisfactory footing. At Ymir a new strike is reported to have been made on the Foghorn, as a result of systematic exploration; 10 ft. of galena of good shipping grade have been exposed 600 ft. in on the drift, at a distance from the surface of about 500 ft.

Rossland.—Last month's returns from Le Roi show an estimated profit of $34,000, allowing for all deductions. The new developments at the 1,450 ft. continue to promise well, the average width of the orebody being 5 ft. and the values about $20. The receipts of Le Roi No. 2, for the month, were $35,938. Encouraging reports have been received of work on the Zodiac, Sophie mountain, A company was incorporated rather less than a year ago, and development operations have since been in progress. Recently a promising orebody was opened, and in consequence three shifts are now employed.

Monterey Jan. 4.

In the district of El Oro the damage done by the breaking away of the Esperanza dam on December 1, by which 14 lives were lost, and the Esperanza and El Oro mills left without water and closed down, is fast being repaired and all will soon be again in good running order. The Dos Estrellas continues in excellent condition and the decision of the August meeting to push development work rather than to increase the dividend has had a beneficial effect in every way. The stock is now selling at $3,700, being double the figure of six months ago. As a result, some of the other small, dormant companies are beginning to show life. The San Patricio has levied an assessment of $5, which is being met, and prospecting by diamond drilling will be started in place of the more expensive drilling. A very encouraging strike is reported from the America in Tlalpujahua. And a new company, known as the Compania Explotadora de Minas de El Oro y Tlalpujahua, has been formed in Mexico City, with José J. Reynoso general manager, to open up ground adjoining the Dos Estrellas. Frank Turner, of Victoria, B. C., and Chas. H. Chick, of Grand Rapids, Mich., are examining ground in the district

In the State of Michoacan, Carlos Eisenmann is said to be expecting the representatives of the Paris Rothschilds to examine some promising claims he is presenting to them. The railroad of 250 km., projected between Tolucan and Sultepec and Temascaltepec, is believed to have passed into the hands of A. E. Stillwell and associates, who are building the Kansas City, Mexico & Orient. A. J. Peyton & Co., of New York, have withdrawn their offer of $3 a share for the Doña Luisa Copper & Gold Mining Co.

Perth, Dec. 5.

The November gold yield of this State was 196,152 oz., valued at £696,343.

Kalgoorlie.—The royal commission of inquiry into the matter of the Boulder Deep Levels has made its report, and it is now issued by the government. Its conclusions reveal as unsatisfactory a state of affairs in connection with management generally, and Frank Gardner's action in particular, as could well be. One cable alone, which I here give in full, and which was carefully omitted by Mr. Gardner in his "frank" copies of his correspondence with Mr. Nichols. This cable reads as follows: "Should this favorable nature continue, we must secure control of property. This must be kept perfectly secret from London. I think you had better at once cable as follows: 'Results are very discouraging.' You may rely that I shall do my best in your interests."

This, from one of the directors of the company to the mine manager, needs very little comment

The report has also shown the speculation in shares which went on, and the profits made by the underground manager, etc. It is evident by his selling just when the high assays were sent to London that he knew perfectly well the real value of these assays. There is no doubt that the public will insist on all companies being represented here by a local directorate, and it is probable that fresh legislation on the subject will shortly be brought forward. Mr. Ralph Nichols is still in charge of this mine, as also of the Perseverance.

Recent work on the Ivanhoe, in the southwest corner, has disclosed a much larger body of ore than was estimated. A thick vein, very rich in placers, was found to split off from what is known as the Horseshoe No. 4 lode and run across the corner of the Ivanhoe property. In a winze now sinking below the No. 5 level a further split is seen, and a new make of ore outside the original channel. This find is of great importance, and will be opened up vigorously. Sinking the main shaft has been resumed below the 1,200-ft. level. Four additional cyanide vats have been erected.

Sydney Dec. 12.

The Broken Hill mines are taking full advantage of the favorable conditions of the metal market, and considerable activity is displayed. The ore raised from the Proprietary mine during the four weeks ended November 30 amounted to 48,500 tons, and the output from the smelters was 565,074 oz. silver, 5,389 tons soft lead, and 63 tons antimonial lead. The number of men employed at the mine totaled 3,173, of whom 1,698 were engaged underground and 1,475 on the surface. The salt-cake plant at the mine works very satisfactorily and about 600 tons of tailing are treated daily. The Block 14 company also maintains a profitable output of zinc concentrate, the Potter (acid) process being in use. During the last five-week run, 2,450 tons of tailing, assaying 17.6 per cent zinc, 6.3 per cent lead, and 7.6 oz. silver, were put through. The resulting concentrate comprised 739 tons of 'firsts,' assaying 42 per cent zinc 3.5 per cent lead, and 11 oz. of silver, and 5 tons of 'seconds' assaying 22.5 per cent zinc, 13 per cent lead, and 13.5 oz. silver. The Sulphide Corporation is making a special feature of the distillation of zinc from the ores from the Central mine, with the subsequent smelting of the residue for silver and lead contents. The zinc concentrate is roasted in reverberatory furnaces, and after mixing with coal, is distilled in a spelter furnace containing 204 retorts of the gas-fired regenerative type. The corporation has just completed the installation of a magnetic separation plant capable of treating 1,200 tons of tailing weekly. At Block 10 mine, the sulphides at the bottom level have been proved to be of much better quality than those worked 200 ft. higher up, and a substantial profit has been shown on each week's operations. At the South mine, exploratory work at the different levels has exposed additional supplies of ores, so that, notwithstanding the large output which is being maintained, the estimated reserves of ore show no alteration and stand at some 1,250,000 tons.

The gold production of the State of New South Wales during the month of November amounted to 29,480 oz. fine, and compares favorably with the corresponding month in 1903. The reef intersected by the cross-cut at the Long Tunnel mine, Walhalla (Victoria), has proved fully up to expectations and the return of this mine to the list of producers affords grounds for much satisfaction. The output from this mine stands as a record for the State, 694,269 oz. of gold having been obtained from 549,140 tons of quartz, while the dividends which extended over the years 1869 to 1899 amounted to £1,229,400, or £512 5s. on each £10 share. The sinking of a new shaft then became a matter of necessity for the economical working of the mine. The work was started in 1902 and by the middle of November this year the shaft had been put down to a depth of 2,880 ft. and a cross-cut driven 281 ft. to the reef. The South New Moon mine at Bendigo crushed 14,743 loads for a return of 23,418 oz. of gold valued at £92,505, during the half-year ended November 30. The average yield per load was 1 oz. 11 dwt. 18.5 gr., and the total expenses, including development work, amounted to 17s. per load.

The output from the mines in the State of Queensland during the month of November amounted to 52,102 oz. fine, and is a decrease of 5,314 oz. for the same month in 1903. The Queen's Cross mine, Charters Towers, declared dividends amounting to £265,000 during the past 12 months, but the directors in their half-yearly report, foreshadow a reduction, so that a vigorous policy of prospecting may be pursued. Operations undertaken in this direction have so far revealed little of value, but there is a number of veins and a considerable area of ground which remain yet to be tested. The returns from the Mount Morgan mine show a marked improvement on the corresponding term last year; the company has paid the usual monthly dividend of £12,500. The excavations have been started for the new smelting works and tenders have been let for the plant required, which promises to be the most up-to-date in Australia.

The colliery proprietors in the Northern district, N. S. W., have failed to come to an amicable agreement with the miners respecting the lowering of the cutting rate, and have consequently decided to reduce the declared selling price of best coal to nine shillings a ton, as from January 1 next. In terms of the provisions of the award of the Arbitration Court this carries a decrease of four pence a ton in the hewing rate to be paid to the miners, and a corresponding reduction in the wages of all the other colliery employees. The miners have hitherto successfully staved off any reduction, and it is fully expected that the present dictum of the owners will not be accepted without a struggle.

Johannesburg Dec. 5.

A great deal of nonsense has been written in regard to the so-called slavery of the Chinese. I would that millions of white people in England and America, living in the congested districts, were as well fed, well clothed and well housed as the yellow men who have come among us as mine laborers. It is well to note that of all the disturbances that have occurred so far, none can be put down to dissatisfaction with their surroundings by the Chinese. The rows have been due solely to internal dissensions, as the refusal of some Chinese to join the secret societies, the revenge of personal wrongs or slights, etc. These outbreaks are growing less. With the aid of the white mounted police and the Chinese police the Mongolians are becoming as orderly as Kaffirs, and in time it is believed that the yellow men will give no more trouble than the docile black workers. One mistake made at the beginning is being remedied. Instead of removing all the Kaffir laborers from a mine about to receive Chinese workmen, a large number of the black through a mine recently where the Chinese. In this way the newcomers quickly learn their duties from the old. Take, for instance, hand drillers; some mines have had great trouble in teaching the ignorant Chinaman how to use a hammer underground. By placing 10 per cent of Kaffirs among the miners in the different stopes, to set the pace at drilling, the Chinaman seems to do much better. Without these examples, he is very liable to imagine that it is impossible to put down a hole three feet deep in such hard material. I went recently through a mine where the Chinese arrived just a month ago. It was astonishing to see how well most of them followed the pace set by the few old Kaffir miners, who were drilling in the same stope. The average number of inches drilled per shift per Chinaman has gone up on some mines from 14 in. to 27 in. This shows the increased efficiency of the coolies.

Almost all of the mine accidents, and there has been a number among the Chinese miners, are due to drilling into old holes, containing pieces of dynamite. The Chinaman is paid by the inch drilled. When he goes to a stope and sees a hole several inches deep, he naturally tries to get to work before the white boss comes, so as to get credited with the extra inches. As likely as not there is a piece of unexploded dynamite left in the hole, and the driller not only kills himself, but as a rule injures several others in the same stope.

Many of the objections urged against the Chinese are turning out to be unfounded. In the first place, it was claimed that they would bank their savings, and take all the money back to China. This is not so. A store-keeper at one mine told me the coolies were spending their money freely; in fact, faster than the Kaffirs. They have "higher taste," so the store man said, and buy articles costing much more money than the Kaffirs usually spend. Some of the rooms occupied by the better paid Chinamen are artistically decorated, and present a blaze of color. It was said also the Chinaman would prove a filthy wretch, refusing to obey the sanitary regulations, etc., and be a standing menace to the health of Johannesburg. A visit to a Chinese compound, well kept, scrupulously clean, with plenty of water for flushing the drains, and for the much used bath-houses, shows how ill-founded this objection was. Although the Chinese are an expense to the industry, they will prove a great economic success.

PERSONAL.

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Mr. John B. Farish is in New York.

Mr. John A. Church has returned from Texas.

Mr. Philip L. Foster has returned from Mexico.

Mr. L. F. Goldstone, of London, England, is in Mexico.

Mr. Ralph Nichols is on his way from Kalgoorlie to London.

Mr. Martin H. Heller, of San Francisco, is at Maricopa, Arizona.

Mr. R. C. Canby, of El Paso, has been on a visit to New York.

Mr. W. H. Rigg is on his way from London to Southern India.

Mr. Martin Schwerin has returned to New York, from Colombia.

Mr. Rufus M. Bagg, of Chihuahua, Mexico, was in New York recently.

Mr. Philip Argall left Denver on January 3 to examine mines in Mexico.

Mr. H. E. Bennette, of St. Louis, Mo., is examining properties in Oaxaca, Mexico.

Mr. C. E. Fanning is investigating several mining propositions in Guerrero, Mexico.

Mr. G. F. George is looking after mining interests in El Oro and Oaxaca, Mexico.

Mr. E. McCormick is conducting mining operations in the State of Jalisco, Mexico.

Mr. G. E. Alexander is metallurgist with the Oro Mining Co., at Oro, Arizona.

Mr. Russell Robb has become a partner in the firm of Stone & Webster, of Boston.

Mr. Wm. B. Potter, of St. Louis, Mo., is in Monterey, Mexico, on professional business.

Mr. J. H. Peacock, of London, is on a tour of Mexico, in search for good mining investments.

Mr. Frank Cogill is Secretary for Mines in the Gold Coast Colony. He is visiting England.

Mr. Curtis E. Knight has returned to Salt Lake City from a surveying trip in southern Nevada.

Mr. T. Lane Carter is now manager for the French Rand Gold Mining Co., Johannesburg.

Mr. W. C. Kinnon has returned from a professional trip in Mexico. He is now on the Pacific coast.

Mr. H. P. Sampson, of Pittsburg, Pa., has been examining mining property in Oaxaca, Mexico.

Mr. George D. Reid has been appointed superintendent for the Ladd Metals Co., of Portland, Oregon.

Messrs. F. L. Sizer and W. J. Elmendorf recently examined the Slocan Star mine, at Sandon, B. C.

Mr. Edward Williams, of Parrilla, Durango, Mexico, has returned home after an extended trip to the States.

Mr. R. C. Warriner has received an important appointment with the Rand Mines, Ltd., at Johannesburg.

Mr. C. W. Kempton, of the Arizona Consolidated Mining Co., has recently inspected the company's properties.

Mr. J. W. Astley is acting as general manager for Le Roi Mining Co. during Mr. McMillan's absence in England.

Mr. R. B. Lamb is inspecting the equipment of the Westralia Waihi gold mines, at Davyhurst, in Western Australia.

Mr. C. J. Garvin has resigned as superintendent of the Annie Laurie mine, at Kimberly, Utah. He is now at Denver.

Mr. Richard Eames, Jr., consulting engineer to La Fortuna Mining Co., of Mexico, will return to New York about January 15.

Mr. E. D. Elson, of Los Angeles, Cal., has returned to the mines of the Mitchell Copper Co., at La Dicha, Mexico, of which he is manager.

Mr. R. B. Brown, of Washington, D. C., has been appointed general manager of the Yaqui Copper Co., at Campo, Santo Niño, Sonora, Mexico.

Mr. S. V. Tench has been appointed superintendent of the Red Ash Coal Co. of Wilkes-Barre, Pa., to succeed the late Edward Smith.

Mr. John Veith has retired as general mining superintendent for the Reading Coal & Iron Co. Mr. Veith has held his position since 1873.

Mr. Reese Tasker has been appointed general mining superintendent for the Reading Coal & Iron Co. to succeed Mr. John Veith, who has retired.

Mr. Arthur E. Pettit, manager of the Simmer & Jack, at Johannesburg, has been visiting Colorado and other mining regions, on his way to Autralia.

Mr. Walter E. Parker, general manager of the Coahuila Mining & Smelting Co. at Viesca, Mexico, has returned to the mines after a trip to his home in St. Louis.

Mr. W. S. Dillon, general manager for the American Mexico Mining & Development Co., of Chicago, has returned to the mines at Velardena, Durango, Mexico.

Mr. James Deemer, manager of the Sierra Prieta Mining Co. at Mapimi, Durango, Mexico, is attending the annual stockholders' meeting at Warren, Ohio.

Mr. William C. Hendrie, New York manager for the Mine & Smelter Supply Co., has changed his address from 130 Liberty street, to 42 Broadway, New York.

Mr. William Magenau has completed an engagement as cyanide expert for the Rossland Power Company, Ltd., of Trail, British Columbia, and has returned to Denver.

Mr. Chas. Morehouse is to be general manager of the Nueva-Australia, Porvenir and Soto mines in the Parral district of Chihuahua, Mexico, to succeed Mr. W. H. Hageman.

Mr. James V. Dignowitz, vice-president of the Montezuma & Hidalgo Mining companies, has returned to Washington, D. C., after an inspection of the companies' properties in Mexico.

Mr. E. J. Williams has resigned as manager of the branch houses of the Austin Manufacturing Co. of Chicago, and has taken charge of the Williams Contractors' Supply Co. of Columbus, Ohio.

Mr. L. C. Hanna, who has for the past 10 years been the active head of the firm of M. A. Hanna & Co., of Cleveland, Ohio, retired from service on January 1. Mr. Hanna's action was influenced largely by ill health.

Col. J. M. Wilson has resigned from the management of the Hearst mining interests in Mexico. He will take charge of the properties of the Morton Trust Co. of New York, which has been acquiring mines in Mexico.

Obituary.

W. F. Delany, formerly superintendent for the Sheridan mine at Telluride, Colorado, died at Denver of euremic poisoning, aged 40 years.

Benjamin W. Frazier, professor of mineralogy at Lehigh University, died on January 3 from apoplexy, aged 65 years. Dr. Frazier had been professor of mineralogy at Lehigh University for 25 years.

W. M. Ferry, a prominent mining man of Utah, and one of the owners of the Quincy mine at Park City, later merged with the Daly-West properties, died at Park City, Utah, January 2, aged 81 years.

Isador Davidov, a mining engineer, died January 4 in New York. He was a native of Russia, in which country he was born in 1867. He came to America 15 years ago. Mr. Davidov had extensive mining interests in Central America. He is survived by a widow.

Henry V. Poor, widely known as a railroad authority and an expert on financial affairs, is dead at Brookline, Mass., aged 92 years. Mr. Poor was the oldest living graduate of Bowdoin College. For many years he published 'Poor's Railroad Manual,' and he also wrote many books on financial subjects. He was one of the founders of the New York Geological Society.

Societies and Technical Schools.

Central Railway Club.—The annual meeting of this club will be held on January 13 at the Hotel Iroquois, Buffalo, New York.

Western Society of Engineers.—Following are the officers of this society for 1905: president, Edward C. Carter; first vice-president, G. A. M. Liljencrantz; second vice-president, Chas. F. Loweth; third vice-president, L. P. Breckenridge; treasurer, Andrews Allen; trustees, B. E. Grant (1 year), T. W. Snow (2 years), Geo. M. Wisner (3 years).

Western Pennsylvania Mining Institute.—The annual meeting of this society was held at Pittsburg, December 20 and 21. Many interesting and valuable papers were read. All the old officers were re-elected as follows: President, Frederick C. Keighley, Uniontown; vice-presidents, William L. Affelder, Mosgrove, Pa.; L. L. Logan, Robertdale, Pa.; and Joseph Simpson, New York; secretary and treasurer, I. G. Roby, Uniontown; auditors, Thomas Hall and John Britt, Sturgeon, Pa.; editor, Frederick C. Keighley, Uniontown.

Trade Catalogues.

Dr. Goldsmith's patent Thermit process is described in a circular issued by the Goldsmith Thermit Co. of New York.

Catalogue No. 4 of the Litchfield Foundry & Machine Co. of Litchfield, Ill., contains many handsome illustrations of the engines made by this company.

From the Buckeye Engine Co. of Salem, Ohio, we have received a little book describing its electric blue-printing machines. It contains many testimonials from those who have used these machines with success.

'Something Pneumatic' for December, published by the Chicago Pneumatic Tool Co. of Chicago contains the usual interesting information about the company's well-known products, as well as many interesting facts concerning pneumatic machines in general.

The Joseph Dixon Crucible Co. of Jersey City, N. J., has incorporated in 'Graphite' for January a large amount of interesting and useful information about its graphite products.

The Flyer No. 253, isued by the Crocker-Wheeler Co., of Ampere, N. J., describes its new variable-speed motors, and contains useful tables with the ratings for motors of different speeds.

L. S. Starrett Co. of Athol, Mass., in its catalogue No. 17 has prepared a careful summary of its great variety of fine mechanical tools. The company has also issued a supplement of the catalogue, entitled 'More Starrett Tools.'

A handsome catalogue—No. 61—has reached us from the Dodge Mfg. Co. of Mishawaka, Ind. It describes the Dodge fly wheels and the hardwood lagging system. The book is handsomely illustrated and is a very creditable piece of work.

The Bucyrus Co., of South Milwaukee, Wis., has published a catalogue of its dredges, which consists chiefly of full-page illustrations of its well-known dredges in operation. There is also a short essay on the gold dredging industry, by Frank W. Griffin.

Catalogue No. 947, of the C. W. Hunt Co., West New Brighton, Staten Island, contains descriptions of the company's coal-handling machinery for power stations, boiler rooms, coaling stations, gas companies, coal yards, shipping docks and manufactories.

The Cleveland Car Co. of West Park, O., presents its latest catalogue, which partly describes and illustrates generally its line of cars for industrial purposes. The book is illustrated with cuts of the cars and their parts, and is a very creditable production.

Industrial.

The Westinghouse Electric & Manufacturing Co., of Pittsburg, has been awarded the contract for all new electrical equipment to be installed by El Oro Mining & Railway Co., at El Oro, Mexico, amounting to about $100,000.

The S. H. Supply Co., of Denver, has shipped another 100-ton concentrating plant, using Bartlett tables, to Mexico, and has closed contracts for a 50-ton concentrating plant to Oregon, and a six-drill air compressor, with necessary boiler capacity, to Montana.

The Burt Manufacturing Co., of Akron, Ohio, has recently shipped one 10-in. exhaust head to the American Steel & Wire Co., one 24-in. exhaust head to the National Steel & Wire Co. and one 120-gal. Cross Oil Filter to the National Tube Co., McKeesport, Pa., making 73 exhaust heads and 154 oil filters now used by the United States Steel Corporation.

Colorado Iron Works Co., of Denver, report the following shipments; six carloads of concentrating machinery to the Granadena Mining & Milling Co., in Mexico; one carload of special large capacity ore cars to the Cananea Consolidated Copper Co., also in Mexico; one carload of crushing rolls to the Montana Zinc Co., in Montana, and six improved impact screens to the Joplin district, Missouri.

The National Electric Co., of Milwaukee, Wis., was awarded the contract for furnishing individual air-brake compressors for the Cleveland (O.) Electric railway, and is arranging to ship several car loads of air-brakes which will be installed under the new convertible type of cars of the Cleveland Electric railway immediately. (This is the largest contract ever placed for these brakes, and it was given after careful comparison of the different systems.)

Turbo-generator contracts closed by the Westinghouse Electric & Manufacturing Co. during the last week of 1904 included two 1,000 kw. outfits for the Haverhill (Mass.) Electric Co. to be used in lighting and power work in that city; two 1,500 kw. outfits for the Rochester, Syracuse & Eastern railroad, and one 1,000 kw. outfit, with exciter, for the Springfield Electric Light Co., Springfield, Mass.; also a 300 kw. turbo-generator, with exciter, for the Northern Electric & Manufacturing Co., of Montreal. The Springfield Electric Light Co.'s contract also included two 500 kw. rotary converters and four 300 kw. transformers.

The rigid specifications drawn by the United States Navy Department for auxiliary engines required in the equipment of vessels of recent construction have done much to improve their general standard of efficiency. It is therefore unusual to find that even these exceptional requirements have been improved upon. Such, however, is true in the case of recent designs of vertical cross-compound enignes built by the B. R. Sturtevant Co., of Hyde Park, Mass., for direct-connected generator driving. They have actually shown upon an economy test a consumption of steam per horsepower per hour fully four pounds less than that demanded by the specifications. These results are characteristic of a line of specially high-grade engines being built by the above mentioned company to develop from 25 to 150 horsepower.

General Mining News.

ARIZONA.

COCHISE COUNTY.

Paradise.—The Duluth & Chiricahua Development Co. has decided to take up the bond on the Sullivan group of seven claims in the western end of the district. It has also decided to hold the eight claims which comprise the Copperopolis group which lies between the Sullivan and the Chiricahua Development Co.'s property. The Chiricahua Development Co. has in its Mars shaft, on the western side of its property, cut through 30 ft. of commercial copper sulphides, the ore being a chalcopyrite. This is at a depth of 300 ft. A depth of 450 ft. has been reached in the Planet shaft which is the main working shaft. The company expects to cut its station at the 500-ft. level and start its cross-cut on February 1. This cross-cut will be about 600 ft. long to cut the vein at this depth. The Cochise Consolidated Copper Co. has increased its force from 20 to 45 men. This property is peculiar in itself, in this district, having three distinct veins of mineral that are entirely separate and of different metals. One is a copper vein carrying gold, silver and some lead. The second vein is a lead vein carrying gold, silver and a trace of copper, and the third vein is a zinc vein carrying a little gold and silver. From the copper vein some good-looking ore is taken out, but it is high in silica. This ore is being stored for future shipments. The zinc is being shipped to El Paso.

Since the opening up of commercial ore on the property of the Chiricahua Development Co.'s ground, capitalists and engineers have been inspecting the district and bonding or buying everything in sight, and great activity is looked for all over the district during the coming year. It is reported that the El Paso & Southwestern railroad will build a branch into the camp the coming summer.

The Smith group, which lies between the Chiricahua Development Co.'s property and the Rieder group has been bonded to William C. Rice, of Houghton, Mich. He expects to begin active operations on the property shortly after the first of the year.

CALIFORNIA.

AMADOR COUNTY.

Kennedy Mining & Milling Co.—On this company's property, at Jackson, another level, at a depth of 2,700 ft., will shortly be opened. Two veins 100 ft. apart are being worked. The 100-stamp mill is kept running at full capacity.

Defender.—On this property at Defender a five-foot ledge of good ore is being worked and a new shaft at the south end of the mine is being sunk.

Empire.—In this mine on Murphy's Gulch, adjoining the Amador Queen No. 2, the men are mainly engaged in hunting for rich pockets. Platinum enough is said to be found with the ore to justify its extraction, which is something new in mother lode ores.

CALAVERAS COUNTY.

Jenny Lind.—The gold dredger operating at this mine is reported as cleaning up from $12,000 to $20,000 per month working day and night with three shifts of three men each. The machine is owned by W. P. Hammon and J. E. Doolittle.

Allison-Jones.—The Carson Creek and Allison groups of Angels, J. H. Meyers superintendent, are now being worked systematically by the Eastern company which has bought and combined them. There is a 40-stamp mill, 16-drill compressor, hoist, chlorination and canvas plant and full equipment on the property.

Etna-King.—A hoisting plant has been installed on this property at Angels, F. F. Ames superintendent, and sinking a three-compartment shaft has been commenced.

INYO COUNTY.

Black Anna.—R. and E. Blake have commenced reopening this mine southwest of Big Pine. When worked some years ago the silver-lead ore paid well.

Southern Belle.—Fine ore is coming from this property from a ledge recently found after having been worked and then lost by former owners.

MARIPOSA COUNTY.

Whitlock.—At this camp the Austin Group company has begun to sink the Regan shaft deeper. At the Farmer's Hope the 5-stamp mill is being put in order for a run. James Helm and Jacob Teats have just completed satisfactory crushings from their claims.

NEVADA COUNTY.

Pittsburg.—This old mine, Nevada City, once a famous producer, is being reopened by Samuel Granger of Grass Valley, and some high grade ore is being extracted.

Gold Canyon Mining Co.—At this company's property, formerly known as the McKillican, near Moore's Flat, F. B. Hill superintendent, some very rich ore is being extracted.

Santa Fe Mining Co.—This company has been organized to take over the Santa

Fé and Dewey placer mines at Canada Hill. Louis Hancke is superintendent.

Central Consolidated Mining Co.—This company at Grass Valley has purchased the Coe mill, rock-breakers, concentrators, ore-cars, etc., for use at its own mine.

Sailor Flat.—This blue gravel mine at Blue Tent has been bonded to C. L. Canfield and others of San Francisco, and will probably be worked in connection with the Canfield mine.

RIVERSIDE COUNTY.

Arlington Gold Mine Syndicate.—At this company's property at Perris, James Noonan superintendent, the tunnel has cut the Hoag ledge at a distance of 1,150 ft. from the mouth. Drifting on the ledge will be continued for 400 ft. southwest until the Gavilan ledge, which is the principal one, is intersected. Plenty of water for a 10-stamp mill is flowing from the tunnel.

SHASTA COUNTY.

Bully Hill Mining Co.—This company at Winthrop is employing about 300 men, 70 of whom are working the Rising Star claim which is now furnishing most of the ore for the smelter. A vertical shaft is about to be sunk some 400 ft. on this claim before any stoping will be done below the adit level. The use of electrical power replacing steam is found very satisfactory, but the steam equipment is to be maintained in case of accident to the electric power line.

Copper Crest.—This group of copper claims near Kennett has been bonded to J. O. Jilson and M. E. Dittmar, who will at once commence development work. The mine adjoins the Mammoth.

SIERRA COUNTY.

Mountain.—At this mine, near Sierra City, L. H. Carver superintendent, a fire has destroyed the power-house, bunkhouse, blacksmith shop and part of the aerial tramway. The mine has been closed down several years, but 30 men have been at work some months getting everything in readiness to operate again. The mill had just been started a day or two when the fire occurred.

SISKIYOU COUNTY.

Cherry Hill.—This mine near Yreka has started up again. The long cross-cut tunnel, now in 1,800 ft., is to be driven ahead to tap the vein at 1,200 ft. depth.

Ohm & Hahn.—This claim at Cherry Creek near Yreka, now under bond to the Mount Vernon Company, is showing a five-foot ledge of blue ribbon rock.

TRINITY COUNTY.

Lapin.—The new 10-stamp mill at this mine at Deadwood, John Bentham superintendent, has commenced crushing.

Three Peaks Mining Co.—T. S. Menderson of St. Louis has sent the money to settle the miner's liens held against this mine, the suit has been dismissed and the mine released. The ownership is still in dispute.

TUOLUMNE COUNTY.

Longfellow.—Sinking operations are about to be resumed at this mine, Big Oak Flat. The main shaft and drifts have been enlarged and powerful pumps have been installed.

American Industries Co.—The bond on the Omega Table Mountain gravel mine has been assigned by C. W. Ayers to this company, the purchase price to be $50,000.

Morris Tunnel Mining Co.—This company, after three years' work, has reached the end of the upraise connecting the tunnel and shaft. Active work will now be prosecuted.

Mountain Lily.—The lessees of this mine have recently uncovered some very good ore.

COLORADO.

CLEAR CREEK COUNTY.

During the month of December the ore shipments from Idaho Spring amounted to 317 cars, for over 6,000 tons of smelting ore and concentrate. This is the best month in the history of the district. The shipments of ore for 1904 amounted to 2,148 cars, a gain of 68 per cent over 1903.

Wilcox.—At this mine, at Georgetown, the tunnel has penetrated a five-foot ledge at a distance of 3,700 ft. from the portal.

GILPIN COUNTY.

Shipments of ore from the Black Hawk depot for December were 6,509 tons, making the largest shipping month of the year.

Gunnison Mining, Smelting & Refining Co.—It is reported that this company, recently organized, will at once begin the erection of a smelter near Gunnison.

Gold Cross.—The 10-stamp mill at this mine is nearly completed.

OURAY COUNTY.

Security Gold Mining Co.—This company contemplates the erection of a mill on Cow creek.

Treasury.—The 10-stamp mill at this mine has been started up and is said to be in successful operation.

SUMMIT COUNTY.

The estimate of the mineral production of this county for the past year is as follows: Gold, $345,000; silver, $230,400; lead, $113,000; zinc, $107,835; copper, $7,000; total, $803,235.

Country Boy.—Arrangements are being made for the installation of electric power to be used in the continuation of the tunnel of this mine.

TELLER COUNTY—CRIPPLE CREEK.

The production of this camp for December is estimated at over $2,260,000. The figures for 1904 are thought to be over $22,000,000.

Findley Consolidated Mining Co.—This company, which is formed by a merger between the Findley and the Valley City companies, has declared a dividend for 1905; $150,000 has been set apart to be paid out at the rate of $12,500 on the first day of each month during the year.

Stratton's Independence.—It is estimated that the shipments made from this mine during December amounted to 5,000 tons of ore, of an average value of $35 a ton.

Ajax.—It is reported that 11 of the 12 lessees on this property, on Battle mountain, are in ore. In December 1,000 tons were produced, one-half being by the company.

Sunset-Eclipse.—The main workings of this property have been leased for 18 months or two years. The property was one of the first locations on the district.

GEORGIA.

LUMPKIN COUNTY.

Boyd.—On this property, which adjoins the Barlow mine at Dahlonega, M. Lowe is doing extensive prospecting work and has made some satisfactory developments. It is understood that North Carolina parties are interested in this property.

Crown Mountain Mining Co.—This company is sinking a shaft to reach the lower Wallace vein, and expects to complete it by the middle of January. The company has its ore bins full, but work in the mill has been delayed by freezing weather, which has interfered with the supply of water.

Dahlonega Consolidated Mining Co.—This company is doing little at present, except to run two giants on its property near Dahlonega. The ore, which is sluiced down to the mill, is said to be much better than that recently taken from the property.

Standard Mining Co.—Work on this company's property near Dahlonega is progressing rather slowly, owing to cold weather and the holidays. The big 16-foot vein has narrowed up recently, but work is being prosecuted in the hope that it will widen out again further down.

IDAHO.

CASSIA COUNTY.

Interstate.—At this mine at Basin it is expected to have a new mill in operation soon.

Walsh-Lofftus.—A carload of uranium-vanadium will soon be shipped from this mine at Basin to Niagara, N. Y. Negotiations are said to be pending by which a syndicate will take over the company.

CUSTER COUNTY.

White Knob Copper Co.—A plan of reorganization for this company at Mackay has been published. It provides that after foreclosure a new company shall be organized with $2,000,000 7 per cent preferred stock, par value $10; and $4,000,000 common stock, par value $10. Of the new preferred stock, $302,000 is reserved for various organization and treasury assets; and $33,000 of the common is reserved for the same purpose. The cash paid in by the stockholders is to be applied to working capital.

IDAHO COUNTY.

Jumbo.—The chlorination plant of this mine at Hump will be started about January 15.

Atlas.—At this mine at Hump a new mill will soon be ready for operation.

OWYHEE COUNTY.

War Eagle Consolidated.—Work will be resumed in the Sinker tunnel in the War Eagle mountain early this year. It is said that the money has been raised for this purpose. The bore is now 6,350 ft. in the mountain.

SHOSHONE COUNTY.

Chesapeake-Tamarack.—An assay made from ore recently taken from this mine on Nine Mile is said to have given returns of 260.6 oz. silver, and 72.5 oz. lead. A drift has been run over 150 ft. upon the lead.

Tiger-Poorman.—At this mine at Burke a shaft will be sunk 200 ft. from the 2,000-ft. level. A sinking pump of larger capacity will be installed.

WASHINGTON COUNTY.

Pueblo Mining Co.—This company is said to be meeting with good success on its property adjoining the Wordenhoff at Weiser.

Weiser.—Negotiations are said to be pending between the Oregon corporation and the owners of the smelter a few miles from this place for the purchase of the smelter. If this is acquired, it will be

used to smelt the copper ores of the Seven Devils district and the gold ores of the Baker district. The smelter has a capacity of 100 tons per day, which can be increased at any time.

INDIANA.

CLAY COUNTY.

Harrison.—This township, in the central part of which Clay City is situated, is one of the most productive of resources and possibilities of any township in the State. Within an area of 45,000 acres, 50,000 ft. of timber have been cut, and 5,000,000 tons of coal have been taken, and there are yet thousands of acres of timber and vast deposits of coal, best quality, untouched. Commercial clays and shales adapted to the production of all varieties of utilities are almost inexhaustible. Here the coal is hoisted alternately with the same machinery that brings the shales and the fireclay to the surface. The building of additional railroads is destined to develop these resources.

Progress Zinc & Lead Mining Co.—This company has incorporated with a capital stock of $150,000. It will operate a mine near Joplin, Mo. C. M. Keller is president, and J. L. Bonham secretary.

GIBSON COUNTY.

Lynn Coal Co.—This company has started its new coal shaft, which will go down to the No. 4 vein. The shaft will be a continuation of its other shafts which are now working No. 6. The work is being pushed day and night. No. 4 is a vein of clear coal.

PIKE COUNTY.

Gold has been discovered in this county on the Carlisle farm northeast of Petersburg. The gold-bearing quartz crops out of the rock on a ledge fronting White river and the deposit seems to be large. Particles of the quartz sent to Denver, Colo., for assaying to be worth $2.40 a ton in gold and 36 in silver. The discovery has aroused some interest.

The coal mining interest and the coal trade has been quiet for a few weeks. It will require several weeks of zero weather before a change can be expected in the situation, as to production and sale. The Mine Workers will hold their annual convention at Indianapolis next week. There is every indication of a short session and a speedy agreement upon the schedules and conditions of employment.

VANDERBURG COUNTY.

Diamond Coal Co.—This company has been incorporated to operate a coal mine, to sink shafts and mine coal. The capital stock is $30,000. The operations will be carried on in Vanderburg county and the principal oce will be in Evansville. Adolph B. Schmidt, G. B. Mann and R. N. Lannert are the promoters and incorporators.

Epworth.—This is a new mining town, established by the Evansville & Ohio River Coal Co., which sunk two shafts during the past year, producing what is known as "Number Four" coal. It far excels the coal now being mined in this vicinity, and approaches the character of anthracite coal. It is a superior fuel to the famous block coal of the Brazil district. The output of the two mines will be about 2,000 tons per day. A large power-house is situated near the shaft, which has a double hoist, and is equipped with two 150 horsepower boilers, and engines of sufficient power to run the hoist and the dynamos for electric lights and electric drills, with which the new mines are equipped. A switch has been constructed to the dummy railroad.

LOUISIANA.

CALCASIEU PARISH.

Jenning's Field.—Layne & Bowler are drilling an old well in the western part of the field to the depth reached by the big gushers. The Eclipse Oil & Sulphur Co. well is down 1,250 ft., with good prospects. The production remains steady, at about 50,000 bbl. daily, and prices in tanks range from 21 to 27 cents. There are about 5,000,000 bbl. in store, most of which is in earthen tanks, and from which the loss by evaporation and seepage will be very great.

MONTANA.

DEER LODGE COUNTY.

Black Diamond.—An important discovery of coal is reported in this mine north of Anaconda. The vein was found at the 100-ft. mark. It is three feet wide and is reported to be increasing.

FERGUS COUNTY.

Barnes-King.—It is reported that this mine at Kendall will be sold to New York capitalists for $1,200,000.

FLATHEAD COUNTY.

Granite Creek.—Two claims on this creek have been bonded to George Robinson for a reported price of $15,000. The claims are known as the Granite Mountain and the Porcupine.

LEWIS AND CLARKE COUNTY.

American Smelting & Refining Co.—This company, owning the smelter at East Helena, has announced a reduction in smelter charges to conform to the reduction in rates recently made by the Montana Central Railroad on lower grades of ore purchased at Neihart.

MISSOULA COUNTY.

Copper Belle Mining & Milling Co.—The property of this company in the Wallace district was sold on January 10 at sheriff's sale. The action that led to the order of the sale was brought by John K. Fiske, acting as trustee for the holders of bonds standing against the company, amounting to $24,114.

Amador Gold & Copper Mining & Milling Co.—This company has come into possession of the Henry Reslip property, consisting of about 150 acres at Nine Mile. The property is situated along the railroad at Iron Mountain and it is understood that it is to be added to the town site of Amador, already staked out at this place.

NEVADA.

ESMERALDA COUNTY.

Combination Mining Co.—This company at Goldfield has declared another dividend of $40,000. This is 12½ per cent on its capital of $320,000.

Belle.—This group of three claims at Bullfrog has been purchased by Dr. G. W. Tibbetts. They lie next to one of the Bullfrog Mining Co.'s groups.

Blue Bull.—A good strike is reported on this claim at Goldfield.

Nevada Power Co.—This company has been organized with a capital of $1,000,000 to furnish power by hydro-electric transmission to Goldfield. The power will be generated by the waterflow of Bishop creek on the eastern slope of the Sierras, 80 miles from Goldfield. The company includes Rodney Curtis, F. J. Campbell, C. M. Hobbs, Guilford S.Wood, of Denver, and Col. Edward Prince, of Quincy, Illinois.

LINCOLN COUNTY.

Blossom.—It is reported that $300,000 worth of ore has been taken from this mine at Searchlight from within a few feet of the surface. A shaft is being sunk near the center of a hill, from which it is intended to run cross-cuts, and drifts from the water-level.

Panacea.—Machinery is being installed at this mine at Caliente, recently purchased by Salt Lake men.

Blue Devils.—A half-interest in this property at Caliente has been sold to Helena men for $5,000.

Trilby.—A 6-foot vein of rich ore is said to have been struck on this group of the gold-silver claims north of Las Vegas.

NYE COUNTY.

Johnnie Mining District.—This district is about 90 miles south of Tonopah, 70 miles southeast of Goldfield, 35 miles southeast of Bull Frog and 80 miles north of Searchlight. It has but recently been organized, though one property known as the Johnnie Consolidated Gold Mining Co., owned by Los Angeles parties, has been systematically developed for more than a year. This property is opened up to a depth of 400 ft. with drifts, levels and winzes amounting to over 4,000 ft. of development, which has exposed a substantial tonnage of profitable ore. Values average from $12 to $18. The Johnnie company has obtained patents for its entire property and its crew has been increased and work is being pushed with renewed vigor preparatory to the erection of the mill which will be located at the mine. Another property of importance is the California & Phoenix, which is owned by Ramsey, Butler and other Goldfield parties. Mr. Butler was the original locator of Tonopah and Mr. Ramsey was one of the first locators in Goldfield. A rich strike has been made on the McClanahan-Smith property. The ore is different from anything else discovered in the camp, being a galena rich in gold. An assay gave $89 gold, 50% lead and some silver. Other locations are daily being made and new strikes reported from various quarters throughout the district. The town site of Johnnie is being laid out at a point about the center of the district at a distance of about three miles from the Johnnie mine and one and one-half miles from the California & Phoenix. The nearest post office is Manse, distant about 25 miles south. Application has been made for a post office to be located at the town of Johnnie. This district has been reached by stage from Ivanpah, the present terminus of the California Eastern branch of the Santa Fe railroad system, being 95 miles from that point. The Tonopah & Tidewater railroad, now being graded from Ivanpah north, will be distant nine miles from the town site of Johnnie, and it is reported that a cut-off from Las Vegas to a point near Manse is to be built by the Salt Lake railroad immediately after the completion of its main line. This will give direct railroad connections with the Salt Lake and Santa Fe, not only for this district, but Bull Frog, Beattysville, Goldfield and Tonopah, as Tonopah is the objective point of the Tonopah & Tidewater railroad.

NEW MEXICO.

BERNALILLO COUNTY.

Washington.—The litigation which has gone on for 10 years over this mine in the Cochiti district has been decided in favor of the plaintiff. The property is the most important in the district.

RIO ARRIBA COUNTY.

Piedre.—A good strike of platinum is reported on this lumber grant 8 miles north of Abiqua from the Chama river.

Luna Lead Co.—The plant of this company at Deming is nearly completed.

SOCORRO COUNTY.

Ozark Vinc Oxide Co.—This company, of Joplin, Mo., is said to have 125,000 tons of zinc ore blocked out in the Magdalena mine at Magdalena. The property produces quantities of lead, copper, zinc and iron, which is all shipped to Joplin.

OHIO.

GUERNSEY COUNTY.

O'Gara, King & Co. have bought from A. W. Brown, T. F. Beidler and W. R. Devore, of Cleveland, Ohio, bituminous coal mines in this and Noble counties, Ohio, that have a production of 3,500 tons a day. The price is said to have been $600,000. The mines purchased are near Cambridge, and with the mines already owned by Mr. O'Gara's firm in Macoupin, Sangamon and Saline counties, Illinois, and Park, Clay, Green and Vigo counties, Indiana, will give the firm a total production of 3,000,000 tons a year.

OREGON.

BAKER COUNTY.

Friday.—A strike of considerable importance is reported at this mine at Sumpter.

Snow Creek.—A vein varying from four inches to two feet in width, and carrying values ranging from $120 to over $300, is reported opened up at this mine in the Greenhorn district. A load of high-grade ore has been sacked for shipment.

Dixie Meadows.—The first car of concentrate sent to the smelter since mill operations were resumed has been shipped by this mine at Sumpter.

Lucy.—Preparations for a resumption of development and for shipment to the Sumpter smelter are being made at this mine in the Greenhorn district.

Red Boy.—This mine in the Granite district is again in operation, and work for the cross-cut has been resumed. A large body of ore, averaging $140 in gold and carrying copper value, is said to have been opened up in one ledge.

Valley Queen.—Two and one-half ft. of good shipping ore is reported to have been opened in a drift on No. 4 vein in this mine on Lake creek, a sub-district of Cable Cove.

GRANT COUNTY.

Marysville.—A transfer by auction and lease to George Walker and associates of about 1,000 acres of rich placer land in this region is reported. The new holders will build a two-line canal to work the property.

Badger.—The mill at this mine closed down on account of lack of water, caused by freezing. The 10 stamps being placed in the concentrating mill to work ore from the Belle of the Woods are nearly ready to run.

Gold Bug.—The shaft at this mine at Susanville is down 220 ft. and a station is being cut.

Black Butte.—Operations at this mine at John Day have been resumed.

JOSEPHINE COUNTY.

Willow Creek.—Col. Frank Ray of New York is said to contemplate building a large dredge on this creek in Jacksonville district.

Gold King.—A suit to foreclose a miners' lease of $2,400 has been filed against this company on Josephine creek.

PENNSYLVANIA.

ANTHRACITE COAL.

Delaware & Hudson Coal Co.—This company contemplates the construction of a new breaker on Throop boulevard at Scranton. This breaker will take the coal which is at present being run through the Marvine & Dickson breakers.

Leggett's Creek.—Operations at this mine at Scranton have been suspended, owing to a 'squeeze' in the new diamond vein, which makes it unsafe for the men to enter their chambers or attempt to blast.

Green Ridge Coal & Coke Co.—An action has been begun against this company at Scranton by the Delaware, Lackawanna & Western Co., to recover $120,000 for coal alleged to have been unlawfully mined from mines belonging to the latter company.

Northend Coal Co.—A cave-in at the mines of this company at Scranton on December 29, caused the destruction of eight houses. The workings have been abandoned for some time.

Morea.—The fire at this mine at Mahanoy City is still burning. It is said, however, to be under control, and the mine officials expect an early resumption of operations.

BITUMINOUS COAL.

Kennerly Coal & Coke Co.—This company has applied for a charter to operate 3,500 acres of coal land at Forwardstown and James Hill, in Somerset County. The capital is $1,000,000. J. J. Kennerly, of Philadelphia, and H. H. Light, of Lebanon, are among the promoters.

H. C. Frick Coke Co.—The purchase by this company of 1,000 acres of coking coal land at Connellsville, has been confirmed. The property lies in the North and South Union Townships, near Uniontown; and the price paid is said to be $1,000,000.

TEXAS.

HARDIN COUNTY.

Saratoga.—The Britain Oil Co.'s No. 1 is in and is good for 500 bbl. daily; it is 1,600 ft. deep and has 120 ft. of strainer. Guffey Greer No. 1 has started flowing again after being choked up for several weeks. The Little Jap Oil Co.'s No. 4, 1,500 ft. from Guffey No. 1, has been brought in and runs 500 bbl. This company's No. 1 has been abandoned.

HARRIS COUNTY.

Humble.—The projected pipe lines for which surveys have been made are not yet under construction, although a good deal of the material is on the ground. The past few weeks have not shown the certainty of a productive field, and pipe line owners will wait until a steady output is secured. Everything here is "in the air," and when a well does reach an interesting stage a blow-out ruins it. How long this will continue is unknown, and operators are not as optimistic as they were before the big gas upheavals.

Seabrook.—The Seabrook Oil Co., which holds leases on 800 acres near the mouth of Clear creek, intends drilling.

JEFFERSON COUNTY.

Beaumont.—The Central asphalt property, at Port Neches, will be operated by a new corporation called the General Refining Co., of Beaumont. The plant will be equipped to refine kerosene, and the asphalt will only be a by-product. Part of the capital contributed is in the form of 1,000,000 bbl. of oil in store at Jennings. Several wells on Spindletop have been equipped with perforators and are good for 100 bbl., while wells are being drilled by W. P. Bowler, B. Andrews and Burrows & Benckenstein. The crude market is very quiet, but steady, and prices are a little stiffer, at 31 to 35. The Texas oil is going to the refineries, while nearly all the fuel oil is being shipped by rail from Jennings. Shippers complain of the scarcity of cars, but that is always the case when oil is cheap and the railways have need of it themselves.

UTAH.

SALT LAKE COUNTY.

Utah Consolidated Smelter.—Shipments of copper bullion during the week ending January 7 aggregated 366,122 pounds.

Bingham Consolidated Smelter.—Copper bullion shipments aggregated 304,241 lb. during the week ending January 7.

United States Smelter.—During the week ending January 7 shipments aggregated 258,488 lb.

Valentine.—A contract has been let to continue the tunnel at this Bingham mine another 500 ft. In the tunnel a 12-ft. ledge is exposed, from which shipments have been made recently. J. W. Cairnes is manager.

WASHINGTON.

FERRY COUNTY.

Keller & Indiana Consolidated Smelting Co.—A circular from the superintendent of this company's plant at Keller, reports that preparations for the construction of the smelter are going forward rapidly. A dam across the San Poil river, has been completed, and a tramway between the mine and smelter is contemplated.

Foreign Mining News.

AUSTRALIA.

WESTERN AUSTRALIA.

In the Kalgurli some fine bodies of ore are being opened up in the lower levels. At the 640-ft. level payable ore is being obtained over a width of 30 ft. At the 750-ft. level south, the west lode is yielding fair grade ore over the enormous width of 50 ft., and at the 1,000-ft. level the lode has recently widened out to 15 ft. in thickness, showing telluride and free gold.

Coolgardie.—The Redemption lease is doing well. The last crushing yielded 473 oz. gold from 230 tons. The reef is still carrying splendid gold.

Mulwarrie.—The East Mulwarrie has suspended sinking in order to watch results in the Mulwarrie mine, where the reef is now going down almost vertical, instead of underlying, as supposed, to the east. The Oakleigh lease has crushed 83 tons for 282 oz. gold.

Some sensational finds are being made in all directions.

The Boomer lease, near Red Hill, has obtained 510 oz. gold from 34 tons of ore which was obtained from a small vein in the footwall of the lode proper.

A good patch has been struck at Meekathara, in the Revenue South lease; one-half ton of ore is estimated to contain over 1,500 oz. gold. The owners dollied 600 oz. from 165 lb. weight of ore.

CANADA.

BRITISH COLUMBIA—BOUNDARY DISTRICT.

Boundary.—Negotiations for the sale of the Golden Eagle, a copper property on the north fork of Kettle river, to a Spokane syndicate, are now proceeding. The property is developed by a main shaft down 162 ft., and shipments of $30 ore have been made from time to time. The second furnace of the Montreal & Boston company's Boundary Falls' smelter, has been blown in, simultaneously with the commencement of regular shipments from the Rawhide.

East Kootenay.—The Sullivan Group Mining Co. has approved the issuance of $200,000 in new bonds. At the recent annual meeting the following officers were elected: president, C. Sweeny; vice-president, G. Turner; secretary, J. C. Williams, and treasurer, Bruce G. Clendenning. The Crow's Nest Pass Coal Co.'s production of coal this year approximates 800,000 tons, an appreciable advance over last year's returns. Nearly 2,000 men are now employed at the collieries; the disbursements in wages last month aggregated $127,000.

Boundary Ore Shipments.—Shipments for the week ending December 24 were as follows in tons: Granby, 12,270; Mother Lode, 2,144; Brooklyn Stemwinder, 1,950; Rawhide, 140; Sunset, 600; Emma, 36; Mountain Rose, 660; Senator, 240; Providence, 30; Elkhorn, 20; total for the week, 17,556 tons; for the year to date, 800,085.

For the week ending December 31 shipments were as follows, in tons: Granby, 10,620; Mother Lode, 3,424; Sunset, 480; Montreal & Boston's Brooklyn and Stemwinder, 3,720; Emma, 99; Senator, 264; Oro Denoro, 66; Mountain Rose, 165; total for the week, 18,838 tons; for the year, 818,923 tons.

BRITISH COLUMBIA—ROSSLAND DISTRICT.

Rossland Ore Shipments.—Shipments for the week ending December 24 were as follows, in tons: Le Roi, 2,565; Centre Star, 1,350; War Eagle, 1,140; Le Roi No. 2, 250; Spitzee, 60; Jumbo, 324; Velvet-Portland (milled), 90; White Bear (milled), 30; White Bear, 54; Golden Rule, 5; total for the week, 5,868; for the year, 338,844.

For the week ending December 31 shipments were as follows, in tons: Le Roi, 2,490; Center Star, 1,560; War Eagle, 1,050; Le Roi No. 2, 550; Spitzee, 130; Jumbo, 216; White Bear (milled), 30; total for week, 6,026; for year, 342,325.

CAPE BRETON.

St. Lawrence Coal Co.—This company, composed chiefly of Montreal business men, has been formed to mine coal in Cape Breton. It is capitalized at $500,000, and has purchased the colliery areas at Little Bras d'Or. Mining operations will shortly be started. The property adjoins the Sidney mine areas of the Nova Scotia Steel & Coal Company.

ONTARIO.

H. E. Knobel, of Port Arthur, Ontario, writes to the *Toronto Mail and Empire* on causes retarding the development of the iron deposits of New Ontario. Exploratory work, he says, has shown at least four fields within reasonable distance of Lake Superior from which ore of a desirable quality could be obtained. These include the Atikokan range about 140 miles west of Lake Superior, where one mine alone contains 5,000,000 tons of high grade low phosphor magnetite; the east shore of Lake Nepigon deposts, and those on Little Long Lake, where there are unlimited supplies of specular schists, low in phosphorus and mining from 40 to 50 per cent in metallic contents; and the Loon lake deposits 26 miles east of Port Arthur, where two distinct series have been developed—the upper showing large bodies of low-grade ore, not at present looked upon as a merchantable shipping product, but which could be utilized at a local furnace for foundry pig; and the lower series containing a low phosphorus hematite, high lime, and grading from 55 to 60 per cent in iron. A conservative estimate of the tonnage so far disclosed of both Loon lake series is 25,000,000 tons, the haul to Lake Superior being only four or five miles. Mr. Knobel goes on to point out that the exploratory work has been done almost entirely by Americans accustomed to the severe standards set in connection with the Mesabi and older ranges as to qualities and quantities of ore, which induces them to discredit propositions, which do not absolutely fill the requirements customary in the United States. As, however, it is computed that at the present rate of increase all the known bessemer ores of the American Lake Superior ranges will be exhausted in 22 years, it will not be long before bessemer ores will be at a premium, 50 per cent ores in demand, and even 35 to 40 per cent ores merchantable under favorable conditions. The tariff duty of 40c. per ton imposed by the United States on Canadian ores so reduces the margin of profit as to make the exploiting of Canadian mines for export an unattractive proposition. On the other hand the Canadian bounties on smelting cover both domestic and foreign ores and at present Canadian furnace men prefer to buy in open market such grades and textures of ores as suit their requirements, rather than buy little known domestic ores. That this is the case is shown by the bounties paid out for pig iron in the fiscal year 1903—$494,534 being paid on 274,740 tons of pig made from foreign ores, and only $125,415 on 46,450 tons produced from domestic ores. The writer urges that as ores of the necessary quality exist in New Ontario sufficient for all requirements of Canadian furnaces, the bounty on pig iron made from foreign ores should be rescinded.

MEXICO.

CHIHUAHUA.

The government of Chihuahua is reported to have granted to W. C. Greene concessions for the establishment of a large smelter and the construction of a railroad, telegraph and telephone systems, and an electric power plant.

It is understood that the Guggenheim Exploration Co. will, while taking inventory, close down temporarily several of its smaller properties, particularly in Michoacan, and those off the railroads. The company has given up its leases on the Descubridora, near Hornillas, in the State of Durango, and the Carmen, of Minas Viejas, near Villaldama. The latter of these, commonly known as Villaldama, is an old property, owned by an estate of which Judge Hallett, of Colorado, is administrator and James M. Morlan, of Monterey, Mexico, the resident manager. The property is about 12 miles from the Villaldama station of the Mexican National railroad, 60 miles north of Monterey. It has its own railroad from Villaldama and is a paying proposition, having given to its owners between $5,000 and $10,000 Mexican per month for the last 10 years. Why the Guggenheims gave up the lease is not clear, unless the selling-price—for they had an option upon it—seemed too high. Mr. Morlan has put in a new superintendent, and it will be worked under the direction of Judge Hallett until a purchaser can be found.

The Descubridora also, which the Exploration company has given up after spending considerable money on exploration work, is in the hands of the owners, the Descubridora Mining & Smelting Co.; and though covered with water, it is believed to be an excellent copper property. The owners have called in W. R. N. Dickman, of Dickman, McKenzie & Potter, of Chicago, to make a thorough examination and advise as to future action.

Messrs. Charles Wilhelm and Mat. Dahlgren are reported to have made a rich strike on Conchus, near Velardeña, and they, together with Juan M. Campos, have sold the Tecolotes, of Velardeña, to the American, Mexico Mining Development Co., though the price is not made public. The latter is the company, made up chiefly of Chicago capitalists, which has a large tract of ground adjoining the Compania Metalúrgica de Torreon. It has just obtained a concession for a smelting plant at San Lorenzo, near Velardeña, where it will probably put in a 60-ton McDonald pyritic smelter, and later a 100-ton. The concession requires that the smelter be in operation in two years, and includes the right to build railroad, telegraph and telephone lines needed in connection with the mines and smelter. At the recent visit of the Guggenheims, it was decided to erect a 100-ton smelting plant at Velardeña, and plans are being drawn up. It is now the intention to make this new plant as near a model as it is possible to make it in regard to the automatic and mechanical handling of the ores and feeding of the furnaces, and throughout the entire works. This plant will also be under the management of Willard S. Morse, the present general manager of the southern department of the American Smelting & Refining Co., with T. S. Austin of the southern department, as general superintendent. Its other officers have not yet been determined upon. C. C. Codman has also a concession for a smelter in Durango, and A. B. Callender, former general agent for the Torreon Metallurgical Co., and previous to that with the American Smelting & Refining Co. at Monterey, is compiling data in this connection, though it is looked upon as a doubtful scheme by many. The Tepehuanes, at Santo Niño, has ordered a 25-ton cyanide plant.

NEW CALEDONIA.

Exports of ores from New Caledonia for October and the ten months ending October 31, are reported by the *Bulletin du Commerce* of Noumea, as follows, in metric tons:

	October.	Ten months.
Nickel ore	26,399	66,942
Cobalt ore	1,765	7,977
Chrome ore	6,629	36,391

The October exports of nickel ore were very heavy. All of them went to Europe.

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

(See also Market Reviews.)

ABRASIVES—		
Bort as to size	carat,	$10.00@$18.00
Carborundum, f.o.b. Niagara Falls, Powd	lb.	.08
Grains	"	.10
Corundum, N. C.	"	.07@.10
Chester, Mass.	"	.04½@.05
Craigmont, Ont	"	.05½@.06½
Mont. f.o.b. Chicago	"	.07@.07½
Crushed Steel, f.o.b. Pittsburg	"	.05½
Emery, in kegs: Turkish flour	"	.03½
Grains	"	.05@.05½
Naxos flour	"	.03½
Grains	"	.05@.05½
Chester flour	"	.03½
Grains	"	.05@.05½
Peekskill, f.o.b. Easton, Pa., flour	"	.01½
Grains, in kegs	"	.02½
Garnet, per quality	sh. ton	25.00@35.00
Pumice Stone, Am. Powd	lb	.01¾@.02
Italian, powdered	"	.01½
Lump, per quality	"	.04@.05
Rottenstone, ground	"	.02½@.04½
Lump, per quality	"	.06@.20
Rouge, per quality	"	.10@.30
Steel Emery, f.o.b. Pittsburg	"	.07
ACIDS—		
Boracic, crystals	"	.10
Powdered	"	.10½
Carbonic, liquid gas	"	.12½
Hydrofluoric, 30%	"	.03
48%	"	.05
60%	"	.11
ALCOHOL—Grain	gal.	2.40@2.42
Refined wood, 95@97%	"	.60@.65
Purified	"	1.25@1.30
ALUM—Lump	100 lb.	1.75
Ground	"	1.85
ALUMINUM—Sulphate, com'l.	"	.75@1.25
AMMONIUM—		
Carbonate lump	"	.07½
Powdered	"	.08½
Muriate grain	"	.05½@.05¾
Lump	"	.09½
ARSENIC—White	"	.03@.03½
Red	"	.06½@.06¾
ASPHALTUM—		
Barbadoes	bbl.	.30
Cuban	lb.	.01½@.03½
Egyptian, crude	"	.06@.07
Gilsonite, Utah ordinary	"	.03@.03½
Trinidad	"	35.00
BARIUM—		
Carb. Lump, 80@90%	sh. ton.	25.00@27.00
92@98%	"	26.00@29.00
Powdered, 80@90%	lb.	.01¼@.02
Chloride, com'l	100 lb.	1.25
Chem. pure cryst	lb.	.05
Nitrite, powdered	"	.05
Sulphate (Blanc Fixe)	"	.02
BARYTES—		
Am. Crude No. 1	sh. ton	9.75
Crude No. 2	"	8.00
Crude No. 3	"	7.00
Floated	"	15.75@16.00
Foreign gray	"	13.50
Snow-white	"	17.25@18.75
BAUXITE—Ga. or Ala. Mines:		
First grade	lg. ton.	5.25@5.50
Second grade	"	4.50@4.75
BONE ASH	"	.02½@.02¾
BORAX	"	.07½@.07¾
BROMINE—Bulk	"	.48
CADMIUM—Metallic	"	1.40
CALCIUM—Acetate, gray	"	1.87½
Acetate, brown	"	1.25
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J.	sh. ton	65.00
CEMENT—		
Portland, Am., 400 lb	bbl.	.90@1.25
Foreign	"	1.25@1.75
"Rosendale," 300 lb	"	.80
Slag cement	"	.75@1.25
CHLORINE—Liquid	"	.30
Water	"	.10
CHROME ORE—		
(50%) ex-ship N. Y.	lg. ton.	19.00@19.50
Bricks, f.o.b. Pittsburg, M.	"	175.00
CLAY, CHINA—Am. com. ex-dock, N. Y.	lg. ton	7.75@8.00
Am. best ex-dock, N. Y.	"	9.00@9.25
English, common	"	11.00@11.25
Best grade	"	16.75
Fire clay, ordinary	sh. ton	4.25
Best	"	6.00
Slip Clay	"	5.00
COPPERAS—Bulk	100 lb.	.47½
In bbls	"	.52½
CRYOLITE	"	.06½
EXPLOSIVES—		
Blasting powder, A	25-lb. keg	.65
Blasting powder, B	"	1.40
"Rackarock," A	lb.	1.40
"Rackarock," B	"	.18
Judson R.R. powder	"	.10
Dynamite (20% nitro-glycerine)	"	.13
(30% nitro-glycerine)	"	.14
(40% nitro-glycerine)	"	.15
(50% nitro-glycerine)	"	.16½
(60% nitro-glycerine)	"	.18
(75% nitro-glycerine)	"	.21
Glycerine for nitro	"	.11½@.11¾
FELDSPAR—Ground	sh. ton	9.75@10.00
FLINT PEBBLES—		
Danish, Best	lg. ton	14.75
French, Best	"	11.75
FLUORSPAR—		
Lump	sh. ton	8.00@10.00
Ground	"	11.50@13.50
FULLER'S EARTH—Lump	100 lb.	.80
Powdered	"	.85
GRAPHITE—		
Am. pulverized	"	45.00
Best flake	"	150.00
Ceylon, common pulv	lb.	.02¾@.03½
Best, pulverized	"	.04@.08
German, com. pulv	"	.01¼@.01½
Best, pulverized	"	.01½@.02
Italian, pulverized	"	.01¼
GYPSUM—Ground	sh. ton	8.00@8.50
Fertilizer	"	7.00
Rock	lg. ton	4.00
English and French	"	14.00@16.00
INFUSORIAL EARTH—		
Ground Am. best	"	20.00
French	"	37.50
German	"	40.00
LEAD—Acetate, white	lb.	.08½@.08¾
Brown	"	.06½@.06¾
Nitrate, com'l	"	.06½
" granular	"	.08¼
MAGNESITE—Greece.		
Crude (95%)	lg. ton	6.50@7.00
Calcined	sh. ton	16.50@17.00
Bricks, best imp. f.o.b. N. Y.	M.	155.00
Bricks, domes, per qual., f. o.b. Pittsburg	"	160@200
MAGNESIUM—		
Chloride, com'l	lb.	.01¾
Sulphate	100 lbs.	.55@.95
MANGANESE—		
Crude powd. 70@75% binoxide	lb.	.01½@.01¾
75@85% binoxide	"	.01¾@.02½
85@90% binoxide	"	.02½@.03½
90@95% binoxide	"	.03½@.05½
Ore	unit	.18 @.20
MARBLE—Flour	sh. ton	6.00@7.00
MICA—N. Y. gr'nd, coarse	sh. ton	33.00@38.00
Fine	lb.	.00½@.02
Sheets are sold as to size and quality.		
MINERAL WOOL—		
Slag, ordinary	sh. ton	19.00
Selected	"	25.00
Rock, ordinary	"	32.00
Selected	"	40.00
OZOKERITE	lb.	.11½
PAINTS AND COLORS—		
Litharge, Am. pow'd	"	.05½@.06
English glassmakers'	"	.08½@.08¾
Lithophone	"	.02½@.06½
Metallic, brown	sh. ton	19.00
Red	"	16.00
Ocher, Am. common	"	8.50@9.00
Best	"	16.00
Dutch, washed	lb.	.02½
French, washed	"	.01½@.01¾
Paris green, pure, bulk	"	.12
Red lead, American	lb.	.06½@.06¾
Foreign	"	.07@.08½
Turpentine, spirits	gal.	.54
White lead, Am., dry	lb.	.05@.05½
American, in oil	"	.06@.06½
Foreign, in oil	"	.09@.09½
Zinc white Am. extra dry	"	.04½@.04¾
Foreign, red seal, dry	"	.06 @.08½
Green seal, dry	"	.06½@.09½
POTASSIUM—		
Bicarbonate cryst.	lb.	.08½
Powdered or gran	"	.14
Bichromate, Am.	"	.08½@.08¾
Scotch	"	.08¾@.08¾
Bromide	"	.30
Carbonate (80@85%)	"	3.50@4.00
Caustic, ordinary	"	.04½
Elect. (90%)	"	.06½
Chlorate, powdered	"	.08½@.08¾
Crystals	"	.08¼@.08½
Cyanide (98@99%)	"	.19@.20
Kainit	lg. ton	9.30
Manure salt 20%	100 lbs.	.66
Double Manure Salt, 48@53%	"	1.12
Muriate, 80@85%	"	1.83
95%	"	1.86
Permanganate	lb.	.09½@.09¾
Prussiate, yellow	"	.13½@.14
Red	"	.35½@.36
Sulphate, 90%	100 lb.	2.11
96%	"	2.14
Sylvinit	unit	.41
SALT—N. Y. com. fine 280 lb.	bbl.	.72@1.18
N. Y. agricultural	sh. ton	4.40
SALTPETER—Crude	100 lb.	3.85
Refined	"	4.25@4.75
SILICA—		
Ground quartz, ord'ry	sh. ton	9.00@10.00
Best	"	12.00@13.00
Lump Quartz	"	2.50@4.00
Glass sand	"	2.75
SILVER—Nitrate Crystals	oz.	.37
SODIUM—		
Bicarb., ord., bulk, f.o.b. works	100 lb.	1.30
Extra domes, f.o.b. works	"	3.50
Bichromate	lb.	.06¾
Carbonated ash, high test, in bags, f.o.b., works	100 lb.	.75@.77½
Foreign, f.o.b. N. Y.	"	.85@.87½
Caustic, 70@76%, f.o.b., works	"	1.75@1.85
Foreign, f.o.b. N. Y.	"	1.90@1.95
Chlorate com'l	"	.08¾@.08½
Hyposulphite, Am.	"	1.50@1.60
German	"	1.75@2.00
Phosphate	lb.	.02½@.02½
Sal soda, f.o.b. works	100 lb.	.60
Foreign, f.o.b. N. Y.	"	.67½
Silicate, concentrated	lb.	.05
Com'l	"	.01
Sulphate, com'l	100 lb.	.65
SULPHUR—Roll	100 lb.	1.85
Flour	"	1.90
Flowers, sublimed	"	2.20
TALC—N. C., 1st grade	sh. ton	20.00
N. Y. Fibrous best	"	10.25
French, best	lg. ton.	25.00
Italian, best	"	30.00
TAR—Oil bbl. (50 gal.)	bbl.	5.10
TIN—Crystals, bbl	lb.	.22
URANIUM—Oxide	"	2.25@3.00
ZINC—Metallic ch. pure	"	.07@.09¾
Chloride solution, com'l	"	.02½
Chloride granular	"	.04¼@.04½
Dust	"	.05@.05½
Sulphate	"	.02@.02½

The Rare Earths.

BORON—Nitrate	lb.	$1.50
CALCIUM—Tungstate (Scheelite)	"	.60
CERIUM—Nitrate	"	10.00
DIDYMIUM—Nitrate	"	35.00
ERBIUM—Nitrate	"	40.00
GLUCINUM—Nitrate	"	20.00
LANTHANUM—Nitrate	"	30.00
LITHIUM—Carbonate	"	1.50
LITHIUM—Nitrate	oz.	.60
STRONTIUM—Nitrate	lb.	.07@.07½
THORIUM—Nit. 49@50%	"	4.50
URANIUM—Nitrate	oz.	.25
ZIRCONIUM—Nitrate	lb.	8.00

Note—These quotations are for wholesale lots in New York, unless otherwise specified, and are generally subject to the usual trade discounts. Readers of the ENGINEERING AND MINING JOURNAL are requested to report any corrections needed, or to suggest additions which they may consider advisable.

THE ENGINEERING AND MINING JOURNAL
MINING AND METALLURGY ESTABLISHED 1866.

Uniformity in Technical Analysis.

In 1901, a movement was inaugurated toward a reform in methods of technical chemistry. A committee, consisting of Messrs. Clifford Richardson, S. B. Newberry and H. A. Schaffer, was appointed by the New York section of the Society of Chemical Industry for the special subject of cement. Meanwhile, Mr. Thorn Smith, of Isabella, Tenn., had independently collected comparative figures on analysis of typical cement, matte, zinc ore, etc. The results were placed in the hands of Dr. Hillebrand, of the U. S. Geological Survey, for condensation and criticism. Later, a sub-committee on zinc ore was appointed, consisting of Mr. George Waring, of Webb City, Mo., and Mr. George C. Stone, of New York city. Many others, including Dr. C. B. Dudley and Baron Jüptner, have also commented on the need of better work.

Later, the committees previously appointed were excused and a new one—consisting of Mr. W. F. Hillebrand, chairman; Dr. Chas. B. Dudley, Mr. H. N. Stokes, and Mr. Clifford Richardson, secretary—was appointed by the American Chemical Society. This committee suggests the following procedure:

"1. To use every endeavor to impress upon chemists the necessity for such changes, either in methods of analysis or of manipulation, together with a control of the purity of reagents in use, as will make it possible to arrive at greater uniformity in the results of analyses made by different analysts.

"2. To determine whether the lack of uniformity is to be attributed to lack of proper instruction in our schools or to mere carelessness in manipulation, by inviting the coöperation of the instructors in analytical chemistry in the work, distributing among them standard materials for analysis, the results of the analysis of which shall demonstrate the accuracy of the method taught by them.

"3. To test, in conjunction with the National Bureau of Standards, various methods, and determine their accuracy and suitability for general use. It may be said in this connection that the hearty coöperation of the Bureau of Standards has been promised, contingent only on the appropriation by Congress of the funds needed to secure the help of competent chemists. Application for such an appropriation will be made at the coming session of Congress, and it is the desire of the Committee that friends of this movement use what influence they possess to forward it. This may be done, in part, by presenting, in writing to the Director of the Bureau, arguments in favor of coöperation, especially when strengthened by a clear statement of specific problems whose settlement may have commercial importance.

"4. To prepare samples of materials of different character, whose exact composition shall have been determined by the most careful analyses of experts.

"5. To place such samples in the care of the National Bureau of Standards for preservation, and distribution to persons desiring to test their methods of analysis or of manipulation, or to check the work of students or technical chemists employed in works.

"6. To invite the coöperation of persons interested in the analysis of any particular class of material, by the organization of sub-committees for the preparation and distribution of samples, the chairman of which shall be, for the time being, a member of the general committee and entitled to vote on the subject which his sub-committee has under consideration."

Inaccurate Assaying.

Some experiments at the Jumpers Deep mine, described in our contemporary, *South African Mines*, under date of December 3, 1904, under the title, 'Inaccurate Assay Practice,' seemed to emphasize the fact of gold loss, from volatilization or absorption, by undue exposure of cupels to the muffle heat. The work was carefully done, but it seems to be an illustration of systematic and conscientious oversight. Perhaps the best comment is the following letter, by Mr. H. A. White, also taken from the source noted.

"The contribution in your esteemed journal of December 3 by Clifford Lee suggests, on a casual perusal, that he is attempting, somewhat laboriously, to be funny. For instance, the weight taken is given as so many 'milliemes'; now, this is not a weight, but a proportion. Further, experiments numbered 1 and 2 are stated to show results after parting; but no silver was added for parting purposes, in accordance with the immediately preceding sentence. Percentage loss could apparently be increased up to 100 per cent by taking a small enough quantity of gold for the trials.

"The use of No. 8 cupels for 45 grams of lead is amusing, and to expect a difference of anything approaching fifteen minutes in time required to complete any two of nine lots in the same muffle, when total duration of cupelling could scarcely exceed ten minutes, can only be referred to an attempted increase of the gaiety of nations. The appointment of a committee of "practical men," to be complete, would require the presence of a professional jester. Moreover, generally speaking, these experiments absolutely show nothing not well known to every assayer of any reputation, since similar, though much more complete and accurate results were obtained as far back as 1860. Such effects of cupellation differences, caused by excessive temperature or undue length of stay in the muffle, are part of the very alphabet of the subject of assaying. They are referred to and explained in every decent text-book on the subject, and Mr. Lee's suppression of this fact can only be due to ignorance, if it is not an attempt at wit. I would, however, call your attention to the fact that 'pure' check gold has not yet become an article of commerce, and that 'pure' lead foil is not procurable entirely free from silver in this country, so far as I am yet aware. The slight differences caused by these two facts are, however, unimportant, and are of the same infinitesimal order as those of experiments 3 and 4, where the probable accuracy of Mr. Lee's balance is equally involved with the cupellation difference. By the way, in these two experiments [in the one case (3), involving some stay after completion in the hot muffle, and in the other (4), removal immediately the finish is perceived], the loss is not increased in accordance with the conclusion arrived at in the penultimate paragraph. Experiment 5, which does support this conclusion, also renders probable the guess that careless parting had something to do with one, at least, of the results quoted.

"I, of course, admit that results similar to Mr. Lee's can be obtained if endeavor is specially made; but, under the usual mine practice, such could not well be the case. If the muffle is kept at the proper temperature, three to five minutes is usually allowed to ensure complete oxidation of lead after 'dulling' has set in. (The phenomenon of 'brightening' is rarely observed with small beads, according to T. K. Rose.) Under such circumstances, the loss may be safely ignored for anything under 5, on any material.

"I should just like to add that the conclusion arrived at with regard to mine samples is not in any way supported by the results shown of action of unusually high temperatures on 'pure gold,' as such samples invariably contain silver which, in fact, is the usual source of error in such cases."

AN OLD ELECTRIC FURNACE.—According to *The Engineer*, of London, an electric resistance furnace was used by Pepys in 1815 for the cementation of iron. He took a piece of pure, soft iron and cut a slit along its length. The slit was filled with diamond dust, which was prevented from falling out by fine iron wire. The portion of the wire containing the dust was wrapped in mica. The wire, thus charged, was heated quickly to redness by the current from a battery. On opening the wire Pepys found that the diamond dust had disappeared, and that around where it had been the wire had been converted into steel.

The Mesabi Iron Ore Range.—II.

By Dwight E. Woodbridge.

The existence of iron ore in northern Minnesota has been known for the past 50 years. So far back as 1850, soon after the first discoveries of iron in northern Michigan, J. G. Norwood mentioned ore as occurring at Gunflint lake, and stated that it appeared to be an eastward projection of the hills known further to the west as the Mesabi range. This extension, he said, was to Pokegama falls of the Mississippi river. Mr. Norwood was correct in these statements, and his surmise that the Gunflint lake deposits would not show great value has not yet been overthrown by later developments. In 1876 James Whitehead, now dead, showed friends a rotted and tree-covered log cabin near the Mississippi river, where he and associates had sunk a shaft for iron many years before, and endeavored to mine. There is no record of the date, but it must have been soon after, if not earlier than, the Norwood report. Mr. Whitehead and associates were Indian traders, and supplies for their mine were bateaued and teamed from St. Paul. There are no records of their work, and no mention has ever been made of it in print. Mr. H. H. Eames, state geologist, in 1865 and following years, was the first on record to note iron ore on the western Mesabi, or to consider it of immediate value. He attempted to explore and develop a prospect near the western end of the range in T 56 R 24 W, and published several assays that showed good quality. But the time had not come for any such enterprise, and Mr. Eames abandoned the attempt.

The State Survey, conducted by N. H. and H. V. Winchell, from 1872 to recently, in its later years referred frequently to the Mesabi. As early as the 11th annual report, in 1884, there was some mention of the district. It has been common report among prospectors that this survey in early years denounced the probability of the discovery of merchantable ores upon the Mesabi, but the Messrs. Winchell deny this, and I have never been able to find any statement to that effect. Certainly in 1891, soon after the original discoveries of economic importance, but prior to the beginning of mine operations, the Survey gave full credit to the probabilities of this new range. It stated that "although there is at present no mining of these ores in Minnesota, they are well known in many places. They were, indeed, the first to attract attention, and were surveyed and analyzed by Professor A. H. Chester in 1875." (Professor Chester's report was upon the magnetites of the far eastern Mesabi, and was unfavorable.) "They are destined to play a very important part in the development of the iron industry of the State."

It was in 1890 that the first successful exploration for iron ore began upon the Mesabi range. This was by Alfred and Leonidas Merritt, two members of a remarkable family, all individuals in the older circle of which were identified with the early development of the range. They lost their grasp and control by a combination of circumstances that no man could be expected to foresee or to direct. These two brothers were the pioneers of the Mesabi, and if they never are known by any other act, the value of their lives to the world at large is far beyond computation. The Mountain Iron mine was found November 16, 1890, by a crew of workmen under Capt. J. A. Nichols, since dead, then in the employ of the Merritts. These prospectors had been sent out to look for hard ore, in the silicious jasper enclosing the present Mountain Iron mine, and Captain Nichols gradually worked south till he sunk pits in soft ore at the north end of the great mine itself. Twenty-three months later a railroad had been completed to the mine, and the discoverers celebrated by inviting two or three hundred friends, old settlers and relatives, on an excursion to the little shaft they had sunk.

In August, 1891, the next large deposit was found by John McCaskill, Captain Nichols and Wilbur Merritt; this has since developed into the Biwabik group of mines. It lies 15 miles due east from Mountain Iron. In a few months the Merritts found the Missabe mountain orebody, now a portion of the Virginia group, and which is between the previous finds. With these discoveries made in a few months of what seemed large bodies of soft iron ore, which could be easily mined, the boom was definitely and decidedly on.

During 1892, Frank Hibbing and others were working 15 miles southwest from Mountain Iron, and the first of the great orebodies of the Hibbing district was brought to light. The south-pointing Fayal bend, reaching down from Virginia, where the iron-bearing member forms the periphery of a spur of the Archæan rocks, was traced the following year by independent work on the part of J. Uno Sebenius, and by D. T. Adams and M. Van Buskirk, in combination. There the magnificent Eveleth group was found by them, by the discovery of the Adams mine by Mr. Adams and Neil McInnis, and by finds of what is now the Fayal, by Messrs. Sebenius and Louis Roucheleau. In September, 1893, the great Stevenson mine, four miles west from Hibbing, was discovered and explored by Edmund J. Longyear. It may be classed as a portion of the Hibbing district. These five clusters of ore deposits, found within two or three years, still remain the chief centers of mining and ore tonnage upon the Mesabi range. Work since then has been largely devoted to filling in vacant spaces. Important orebodies have been found east of Biwabik and west of Stevenson, but the main operations have been confined to the limits mentioned.

In May, 1890, several months prior to the Mountain Iron find, E. J. Longyear began drill operations on the range. He placed a diamond drill on section 34, T 59 R 14, on lands belonging to the Longyear Mesabi Land & Iron Company, and during that year drove a hole 1,300 ft. deep, though without commercial results. But this hole, which was in the nature of a careful trial of formations; the test-pitting of many explorers, and the thoughtful operations of men like Sebenius and Longyear, all furnished a key to the more logical prospectors that they were not slow to use.

In November, 1892, the Duluth, Missabe & Northern railroad was completed to Mountain Iron, and in the following year reached the Virginia group. In 1893, also, the Duluth & Iron Range came in from Mesabi station, from its main line to the Vermilion range, and tapped the three mines that had already been opened at Biwabik. That year shipments from this new range amounted to 620,000 tons.

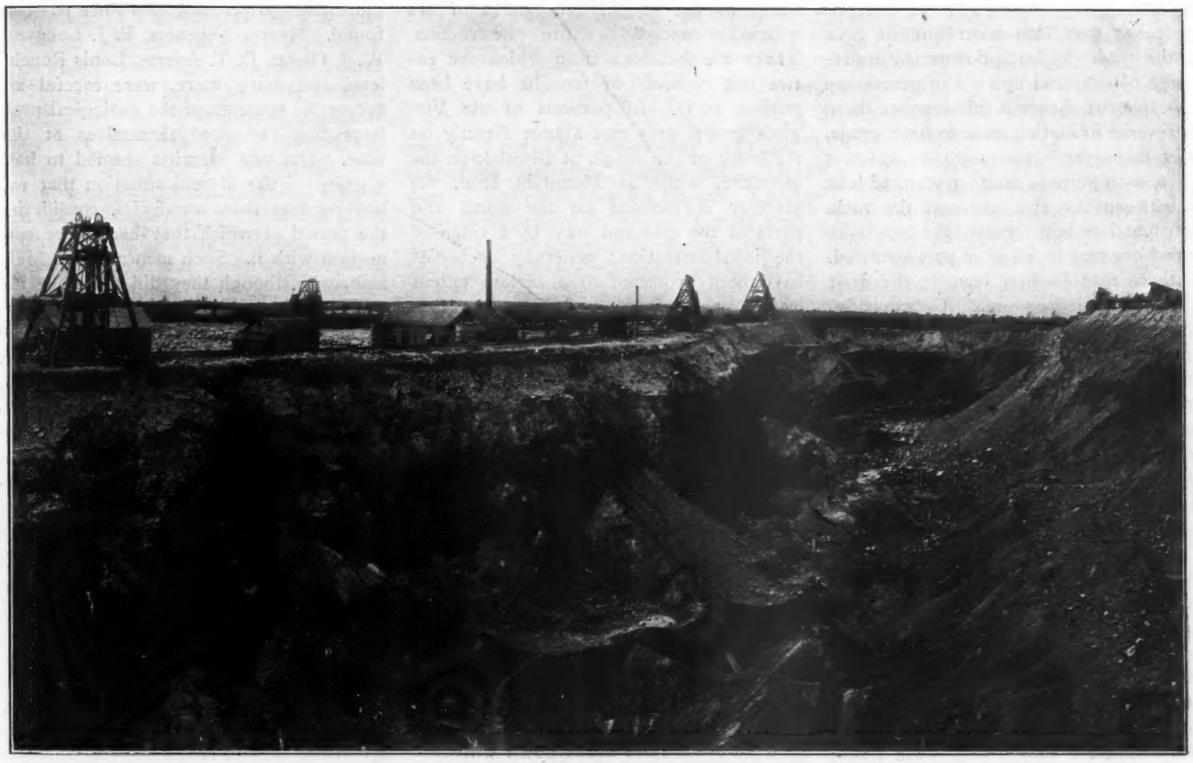
Hardships undergone by these pioneer explorers were of the most severe character, and many a man's life has been shortened thereby. There was never a lack of water, fuel and shelter for Mesabi explorers, but there were no roads, the forests were dense and trackless, filled with almost impenetrable swamps and with burned-over downfalls fully as difficult to pierce as the swamps themselves, and all of these the explorer must traverse, carrying food and supplies for an entire journey upon his back. Distances were great, food was difficult to get, labor was exceedingly expensive, and, at times, singularly inefficient. Outcrops of the ore formation were almost entirely lacking for the 30 to 40 miles of the strike of the range as then outlined, and were confined to a few jasper bluffs near the Mountain Iron northeast of the Adams, and north of the Virginia group, and to an occasional quartzite exposure. Of ore itself, there was almost no surface trace. The 'moose track' part of the Fayal group was shown where the trail of a moose had kicked up red ore; the Biwabik find of John McCaskill was from ore seen in the roots of an upturned tree. Another tree, uprooted by a hurricane, showed the Hale mine, and at other places the mere kicking away of surface moss would expose ore; but this kicking was not done till some one had studied conditions and began to look for iron in those very spots. The drift covered almost everything, excepting the hard hills of the Giants' range to the north.

Methods of exploration in those days

were crude and tentative. Most of the work was by test-pitting, and when water was struck a pit could not be continued. It was the custom to specify in drill contracts that when taconite was cut the drill need not sink into it more than a few inches. The first taconite encountered in an exploration was then considered the bottom of the iron deposits. Naturally a good deal of work was done in quartzite and greenstone and the schists of the older rocks, and still more in the slates lying above the ore formation. Even now, after all the work that has been done, the line of demarkation between ore formation and the so-called 'Virginia slates' is subject to modification by new development and additional discoveries. The word taconite, by the way, was coined by Professor N. H. Winchell to represent iron-bearing formation, and, while still current locally, is an unnecessary addition to an already overburdened vocabulary. Its relation to ore is similar to that of all Lake Superior jaspers, and it corresponds to the jasper of the Gogebic range.

What seems to be the valuable portion of the Mesabi extends from the Duluth & Iron Range railroad crossing, in T 59 R 14, in a generally direct course, to the Mississippi river. With the big Fayal bend into T 57 R 17 it has a length of about 85 miles. For this distance the iron-bearing member is exposed in a strip, which varies in width from about half a mile, as in section 6, T 58 R 15, to about three miles, as indicated by a cross-section at Hibbing. The most usual width is about a mile, and the average dip is 10°. Widest exposures occur in districts where the dip is very slight, about 5° to 8°. These figures give an idea of the probable thickness of the member. East of T 59 R 14 an igneous overflow took place, perhaps prior to the completion of the process of ore concentration. By many, including Chas. R. Van Hise and C. K. Leith, this is thought to have changed the character of the orebodies into a magnetite, frequently very silicious and often quite titaniferous. Others, however, do not hold to this view of change, and believe it a fact that the Mesabi is magnetic far from any probable influence of the gabbro overflow. West of the Mississippi, the ore-bearing member disappears beneath a heavy covering of drift, and work done there has not disclosed any evidence of value. The theory was advanced so far back as 1891, and reiterated more clearly in the recent Mesabi range monograph of the United States Survey, that the western Mesabi is correlated with the Gogebic, and that the two are connected by a sweep of the formation around the western end of Lake Superior.

So far as quantities and characters of ore are concerned, the Mesabi may be separated into two economically important divisions—the eastern, taking that portion of the range east of the west line of St. Louis county, and the western, that part from the west line of St. Louis county to the Mississippi river. The first is characterized by large deposits of high-grade ore, low in phosphorus, silica and alumina, and often with almost an oily, fatty texture; the second by orebodies generally low in phosphorus, high in silica and alumina, and dry, somewhat feldspathic, in which free sand, left from the concentration processes of the solutions upon the iron-bearing chert, has not been eliminated, but remains as seams within the orebodies. It is evident that the process of concentration has not proceeded as far here as in the eastern parts of the range. It is quite probable that this imperfect concentration and a lower elevation of the country are correlative.



MILLING PIT IN DULUTH MINE AT BIWABIK.

The shape of ore deposits upon the Mesabi is as variable as their number and size, while the greater development has been laterally, more often than not at right angles with the strike of the formation. They occupy troughs through which waters may have percolated across the width of the iron-bearing member. While none of the large orebodies has been mined out, so that it is possible to determine accurately its shape, in many places test-pitting and other exploration have been complete enough to give a good idea of structure. There is a sharp boundary line between orebodies and the barren rock on all sides, against which the ore lies in the most irregular manner, the two being often interleaved.

Generally speaking, there are soft ores and hard surrounding rocks, except at Biwabik, where accessory rocks grade into hard, crystalline masses of high-grade ore. Generally, the impregnation of rocks by the solutions that precipitated ore has been carried forward until the rocks became soft and their iron contents high, all within sharply defined and quite distinct limits.

Mesabi orebodies are laid down in channels and rest, as a generalized section would indicate, as follows: First, the surface drift, beneath it an important layer of good ore. Towards its bottom this latter grades through brown and yellow leaner ores into a stratum of poor ore, the gradation being downward in percentage of iron and upward in percentage of phosphorus. Beneath this low ore there is a reverse gradation back to high grade. Under this layer is the jasper on which it all lies, with perhaps another seam of lean ore between the rich ore and the rock. If erosion has been severe, the top layer of good ore may be all or in part removed, and there may be first beneath the drift the strata of leaner ores. Occasionally, as is instanced at the mouth of Mountain Iron cut, ore and rock grade into each other in planes without change of dip; more frequently there is a sag where the stratification enters the ore, on account of the action of solutions that have carried off a portion of the original rock, and the ore is made to conform more closely to the trough in which it lies.

The vertical dimension, or depth, of individual orebodies frequently attains two or three hundred feet, rarely more than 350 ft., except in what are probably pot-holes in the bottom of an orebody, where drill-holes have occasionally penetrated between 400 and 500 ft. vertically in ore. But one or both the nearly horizontal diameters may reach some thousands of feet. The largest of what may with propriety be classed as single orebodies, though operated by several companies, is known to be over two and one-half miles in length and about three-fourths of a mile in width, except where a narrow finger running to the south increases this width to more than a mile and a half. This is probably the largest body of high-grade iron ore known to exist.

It is now known that jasper beneath a stratum of ore, instead of necessarily forming the base of the ore, may be a shelf in ore, or, so far as single properties are concerned, may be regarded as a horizontal division wall separating two or more strata, either or all of which may be of large size and great thickness. Jasper, therefore, has recently been drilled for a depth of several hundred feet, and small amounts of ore of excellent character have been found beneath 120 ft. of it. Deep drilling has become a fad, and a great deal of money has been spent in sinking holes through hundreds of feet of hard jasper, with some success. But the results of this work have not been as important as anticipated, and the tonnage added is infinitesimal, in comparison with the great orebodies lying entirely above rock. So far as now known, every orebody crops out somewhere to the drift.

It is very certain that some time the amount of ore upon the Mesabi was far greater than now. Glacial action has had a tremendous effect upon these soft ores. The protecting rocks, whether granite, schist, or quartzite, or a hard rim of the iron formation itself, probably bore the brunt of the attack, and bodies of ore generally escaped entire destruction. There are locations from which the entire ore contents of troughs have been pushed away. In portions of the Virginia group, ores rest almost directly on the ledge of the schist, at Biwabik on the quartzite, while at Mountain Iron, the orebody is inclosed on the north and parts of the east and west by a ridge of the iron formation; generally orebodies have been protected to a certain extent by the hard quartzite of the earlier formation. But everywhere glacial action is judged to have scraped off ore and carried it south, to the frequent bewilderment of ill-informed prospectors, who have spent much time and money in searching miles to the south where boulders or a thin wash may have been deposited. The drift overlying the lower parts of orebodies is frequently full of paint rock, iron and jasper boulders. At Mountain Iron, about 1,200 ft. south of the encircling rim, the top of the orebody has been broken sharply down about 25 ft., and its upper portion carried off and mingled with the overlying drift. There seems to be good evidence that for this distance, and until the weight of ice grew so great as to break down with immense pressure upon the ore, the northerly rim of the formation protected it. When the Oliver mine was stripped it was found that a deep, regular trough ran through the top of the ore, parallel to its longest diameter. It started in the Lone Jack portion of the mine, deepened as it passed through the Missabe mountain portion, toward the west, and is still to be seen at the foot of the cut running westerly, following, but below, the trend of ore surface. This trough cut to a depth of 65 ft., and was filled with ore pebbles and cement material, varying from 20 to 45 per cent iron. Water has had an influence upon these orebodies only slightly less formidable than that of ice. Channels it has cut are traceable in many places. An interesting exhibition of this is found southwest from Virginia, near Minnewas location.

There have been two phases of development upon the Mesabi. The first was that of tracing formations and discovering orebodies; that has been done. The second is that of outlining individual orebodies and evolving a proper system of mining; these measures, presenting, as they did, new and untried problems. That is another chapter. For each a few men were responsible. In all the early history of the range, when puzzling surface conditions were being worked out, there was free interchange of experiences and ideas between the leaders of development. To this is due in part the rapidity with which the range came into shape upon the maps. So far back as 1892, the field notes of such men as J. Uno Sevenius charted the boundary lines within which, since that time, more than 90 per cent of all ore has been found. Messrs. Sebenius, E. J. Longyear, W. J. Olcott, D. T. Adams, Louis Roucheleau, and many more, were careful and successful students of the geological problems that presented themselves at that time. The two Merritts seemed to have a grasp of the Mesabi situation that was nothing less than wonderful, considering the period at which they had active connection with it. Such men as John Mallman, who, though they did not make important discoveries, went through the woods with packs on their backs, with trained eyes uncovered information that was of value to all. Captain Nichols left his family no legacy but the high distinction of the first important discovery on the Mesabi range, at the close of a long and bitter struggle. Cole & McDonald, as drill contractors, had very much to do with both early and later discoveries. All work was of a private character and commercial nature. The reports of the United States Government form an excellent record, but inevitably must have been, and are, so far as the limits of the ore-bearing formation are concerned, largely at second-hand. Long before the Government took up the geology of the Mesabi range, the economically important limits of the district had been mapped as accurately as they are to-day. This is said in no derogation of the work of the Survey. Most of its results could be secured in no other way, in the very nature of things, than from field and underground explorations of companies and prospectors. These workers had nearly 20,000 drill-holes along the range at their command, as well as the results of years of field work by trained observers. Probably there was never a mining region where the work of companies and explorers was more freely given the public, through the government reports, than by these workers of the Mesabi range. Facilities furnished by great companies could not be duplicated, and by most companies in the field these facilities were utilized most broadly and generously. It is fortunate that this, one of the greatest storehouses of hidden wealth uncovered for ages, should have been in the hands of those whose opportunity it became to lay it bare.

Copper Mountain, British Columbia.

By Jules Catherinet.

British Columbia possesses such abundance and variety of mineral resources that many interesting discoveries have been made in recent years; in some of these specially attractive geologic problems have been met; and in others the relationship of the minerals has cast new light upon the question of ore deposition. To the last named group belong the ores which are the subject of this paper.

In the summer of 1900 Professor J. F. Kemp visited the prospects at Copper mountain on the Similkameen river, 20 miles south of Princeton in the Yale district, and brought back an interesting series of specimens and notes, which have been placed in my hands for more detailed investigation. In the meantime Professor Kemp has printed a note regarding the occurrence of bornite as an original mineral in a pegmatite vein on the Copper Cliff claim,[1] and Mr. O. N. Scott[2] has given a petrographic description and several chemical analyses of the rocks forming Copper mountain. The present contribution deals with the genesis of these ores and with their alteration, and is chiefly based on microscopic study. Some further interest is added to the results, by the identification of sperrylite, the arsenide of platinum, and of native gold. The presence of platinum had been locally announced on the basis of assays, but a fortunate thin section has actually revealed it in both the ore and in biotite. Nevertheless the careful solution of a quantity of the bornite, in acids which are not supposed to attack sperrylite, failed to show the mineral, and the attempts gave results as unsuccessful as those of the several observers who have attacked the ore of the Rambler mine, Wyoming. From the latter, sperrylite can indeed be obtained, but it is rare and much less in quantity than anticipated from assays.

Copper mountain is chiefly a mass of gabbro which rises 1,500 ft. above the Similkameen. Although rounded or domelike on the top, it has a steep slope toward the river, which the outgoing trail follows, along the small ridges which are either landslips or the disturbed outcroppings of faults. The surface wash is ranged in huge furrows, 20 ft. high, and upon these ridges the trail finds a foothold. It is probable that dikes of other eruptives penetrate the mass of gabbro; and it is clear that, in the Sunset claim, which has been most fully opened, there is much silicification of the walls.

The ore occurs in two different ways, which, though apparently contrasted, may yet be genetically akin. The metallic mineral is almost entirely bornite. In the claims on the upper parts of the mountain it coats numerous small crevices in the rock; sometimes in films no thicker than a coat of paint, and again the size of cardboard, but never, so far as shown at the time of Professor Kemp's visit, in large masses. In the Sunset it is, as already stated, accompanied by notable silicification, in that the associated rock be-

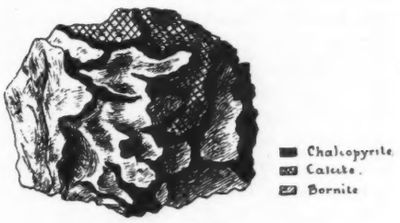


FIG. 1.

comes dense and fine-grained, and has apparently suffered replacement. The bornite, however, lines the fissures. Little veinlets of pegmatite, consisting mainly of feldspar, were observed in narrow fissures, apparently of the same magnitude as those

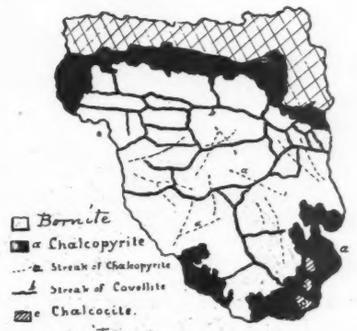


FIG. 2.

elsewhere filled with bornite. They could not but suggest the surmise that the same agency had been responsible for both, and that the filling of the veinlets had specially favored the more broken and open-textured rock.

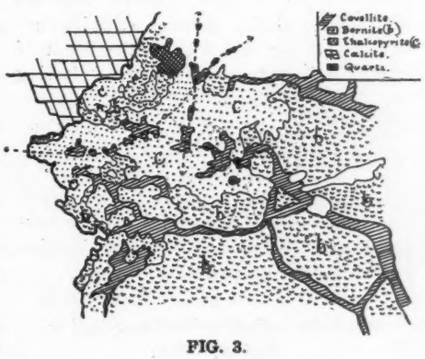


FIG. 3.

The second form of ore deposits is a large, coarse and typical pegmatite vein, which appears on the Copper Cliff claim and contains bornite as one of its constituents. The bornite is in masses, say, half a cubic foot and less, but of irregular shape and scattered through the pegmatite. It is accompanied by chalcopyrite in much smaller amount. Beautiful specimens of peacock ore may be obtained.

If we except the fact that the pegmatite contains the ore, it does not differ markedly from normal occurrences of this rock. The chief feldspar is orthoclase, which here and there forms large crystals. Oligoclase is present to some extent. Tourmaline and fluorite are occasional, and calcite also can be found. Quartz, certainly original, is rare; but some, which is regarded as of secondary nature, has been noted. The calcite likewise may be secondary; yet the exposures show few, if any, signs of extreme crushing or displacement, such as might make marked water-ways, and the secondary minerals which appear are believed to be due to local alteration.

Bornite has been usually regarded as a mineral belonging to the zone of enrichment. It contains much more copper than does chalcopyrite; and it would naturally appear to be the combined result of the renewed precipitation of copper sulphide upon chalcopyrite and of the partial replacement of the latter. This is one of the most interesting questions arising from the study of Copper mountain.

As the result of close examination of hand specimens from the pegmatite dike, it is apparent that the bornite generally builds up large masses; while, in the same specimen, the chalcopyrite nearly always forms smaller patches, and more especially assumes an external position as regards the other sulphide. For some places this relation is so well marked that the chalcopyrite appears around a central mass of bornite as an external rim which exactly reproduces all the embayments between the ore and the neighboring calcite. An attempt has been made in the subjoined sketch, Fig. 1, to illustrate this point.

With the microscope we can see clearly that the vein of chalcopyrite not only exactly reproduces the line of contact, but also remains constant in its thickness. The chalcopyrite thus affords the characteristics of a secondary mineral; and it may be reasonable to credit its formation to an external agent, such as an aqueous solution acting on bornite. This is certainly the simplest and most natural interpretation; but, as it was opposed to the preconception regarding the two minerals, with which the investigation was begun, it seemed desirable to fortify the conclusion.

The chalcopyrite displays in some sections other relations which seem to favor quite strongly its secondary origin. Thus the yellow sulphide is not only present in irregular patches, as mentioned, but also forms throughout the bornite characteristic slender streaks which are quite regular in their thickness. (See Fig. 2.) These afford a close analogy in their behavior with the covellite which in the

[1] *Transactions* Amer. Inst. Min. Eng., Vol. XXXI, p. 182. I am also much indebted to Professor Kemp for assistance and advice during the investigation.

[2] O. N. Scott, 'The Ore Deposits of Copper Mountain, Similkameen District, B. C.,' *Journal* Can. Min. Inst., Vol. V, p. 493, 1902.

same sections forms a great many stringers. As will be shown later, the covellite is undoubtedly of secondary origin. Some of these lines of chalcopyrite fork, or are crossed by others of the same characters, enclosing spaces of triangular and other geometric section. Sometimes, also, a striking parallelism is displayed by these lines which remain straight for their whole length; they form one series which is cut by another affording the same parallelism. If we imagine that the whole orebody was originally chalcopyrite, we cannot account for such a peculiar structure; in fact, we do not see the possibility of explaining why the chalcopyrite could have escaped alteration along such regular and slender spaces while everywhere else it had changed to bornite.

A close study of the mutual relations of the different sulphides displays a fact, which seems more particularly to prove the secondary origin of the chalcopyrite. A section was selected from a hand specimen in which the vein-like habit of the two sulphides, chalcopyrite and covellite, seemed to be especially well-marked. The bornite has been subjected to crushing which gave rise to many little fissures. The latter are nearly all filled with limonite which undoubtedly results from the oxidation and subsequent hydration of the iron sulphide of the bornite. On each side of the fissures there is a thin border of covellite. The latter is evidently a secondary mineral and is derived from the bornite which, as is well known, readily alters to covellite. In the same section the chalcopyrite is also present in irregular patches, and more especially in streaks affording the same characteristics as those of covellite. It is extremely interesting to observe that, wherever the lines of covellite cross the patches of chalcopyrite, they are completely cut in two by the latter. (See Fig. 3.) They reappear on the other side with the same characteristics as before. It is easy in some places to see the connection which formerly existed between different parts of the same crack, and which made of them a continuous line. When, moreover, a streak of covellite comes in contact with a small vein of chalcopyrite, as distinguished from the masses just mentioned, the same relation holds; the yellow sulphide always interrupts the blue one. (See Fig. 4.) All this recalls the principle which is applied every day in mining exploitation: the intersecting vein is later than the intersected one; the chalcopyrite is younger than the covellite, and *a fortiori* is later than the bornite.

The similarity of faulted and faulting veins is still further emphasized by the detection of small masses of covellite still remaining in the chalcopyrite like fragments of an older vein dragged by faulting to a point where they are involved in later deposited vein-matter, forming the "trail of the fault" as F. Freeland expresses it. The included fragments of covellite even seem somewhat corroded by the later infiltrations of chalcopyrite. Other observations lead to the inference that the entry of this last sulphide was accompanied also by the appearance of immigrating quartz and calcite. Veinlets of chalcocite are also to be observed. They are less common than the covellite, but, like the latter, they are cut by the chalcopyrite, as shown in Fig. 4.

An attempt has been made to express the above changes in chemical equations. First, we may write the reaction in which chalcopyrite is supposed by enrichment to give rise to bornite in the process which is reversed in the present case.

Chalcopyrite. Bornite.

$$2CuFeS_2 + CuSO_4 = Cu_3FeS_3 + FeSO_4 + S.$$

At Copper mountain the reaction appears to have proceeded as follows un-

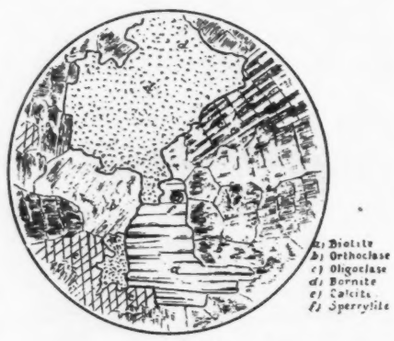


FIG. 6.

der the influence of oxidizing waters from the surface:

Bornite.

$$4Cu_3FeS_3 + 6O + 3H_2O =$$

Covellite. Limonite.

$$12CuS + (Fe_2O_3)_2(H_2O)_3.$$

The limonite was deposited along the cracks, and with the covellite outside of it and along the walls, as shown in Fig. 4, where the dark line down the middle of the covellite veinlets denotes limonite. Waters percolating through sulphides receive sulphuric acid, also as the result of the oxidizing process. Then the following reaction takes place:

Bornite. Chalcopyrite.

$$Cu_3FeS_3 + 2H_2SO_4 + O = CuFeS_2 + 2CuSO_4 + H_2S + H_2O.$$

The H_2S of the reaction, with oxygen and water, would form H_2SO_4, thus perpetuating the process. From bornite, chalcocite results as follows:

Bornite. Chalcocite.

$$Cu_3FeS_3 + CuSO_4 + 2O = 2Cu_2S + FeSO_4 + SO_2.$$

From chalcopyrite, chalcocite also results as follows, as shown by H. V. Winchell[1]:

Chalcopyrite. Chalcocite.

$$CuFeS_2 + CuSO_4 + 2O = Cu_2S + FeSO_4 + SO_2.$$

[1] 'Synthesis of Chalcocite,' *Bulletin* Geol. Soc. of Amer., Vol. XIV, pp. 269-276.

In the present case we have the following succession:

Bornite.

Covellite and Limonite. | Chalcocite. | Chalcopyrite Chalcocite.

The interesting question, which relates to the character of the bornite as an original mineral in the pegmatites, may next be taken up. Much light is cast upon it by the smaller veins of pegmatite, which are, as a matter of fact, quite fresh and unaltered. The feldspars are the most important components, orthoclase being predominant. In places, large masses of biotite appear, and also some isolated crystals of tourmaline.

It will at first appear evident that, if the bornite has been deposited from later solutions, the waters, which have carried it into the veins, at the same time must have affected the composition of the rock, and in particular those components which yield most readily to alteration, the feldspar and the mica. It is probable, also, that the same waters must have contained in solution, some other mineral, such as calcite and silica, traces of which must be found connected with the bornite. But such is not the case. Everywhere the bornite appears completely surrounded by the feldspathic element of the rock or by the mica; and, when it happens to be in contact with some calcite, the relation seems to be purely accidental; in fact, the calcite appeared to have taken rise from the alteration of the feldspars, (oligoclase being abundant), and after the consolidation of the rock. In most cases the feldspars and the mica, which surround the bornite, are perfectly clear and the mica does not show any alteration.

The fact that none of these characters has been displayed by the numerous sections which have been studied, and also the complete absence of any cracks having relation to the introduction of the bornite, warrants the conclusion that the latter is an original mineral in the rock to the same extent as the mica and the feldspar.

The occurrence of copper ore under such conditions and in connection with a pegmatite, is unusual. It is well known that copper ores seem, as a rule, to accompany basic rocks, such as diorites or gabbros. The older French school—which went so far as to classify ore deposits under two heads, namely, ***filons stannifères*** (tin veins), products of fumaroles to be found in acidic rocks; and ***filons sulfurés, dits plombifères*** (lead veins), deposited by thermal springs and always connected with basic rocks—placed copper deposits under the latter class on account of their usual association. In the recent years, however, some interesting cases have been noted where the ores of copper not only accompany acidic rocks, but also display most of the characteristics which belong

to tin veins. Although up to the present, not more than five or six such examples have been found, they are enough to serve as links between the two extreme types of the old classification. In other terms, they establish a gradual transition from the *gîtes stannifères* to the *gîtes plombifères;* they show copper acting first as a correlative of tin, and afterward in typical deposits of tin, acting the part of tin itself.

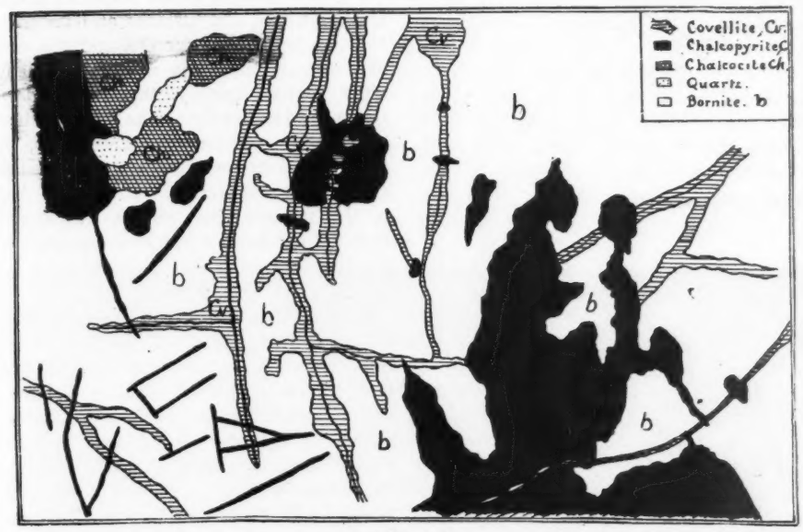


FIG. 4.

At the same time it is possible to trace a gradation according to the nature of the rocks which are favored by the presence of copper ores. Starting from the gabbro and diorite of Canada, and passing through the basic granite of Butte and the biotite-muscovite-granite of Cornwall and Telemark, we reach at last the pegmatite in British Columbia which has formed the subject of this paper.

Such a transition has been pointed out by Professor Vogt,[4] who paid special attention to certain veins in Telemark where the copper ore displays all the characteristics of cassiterite, the most important being a gradual transformation from granite to greisen near the veins. The same character, as is well-known, is exhibited to a high degree by the veins of Cornwall, where tin is associated with copper. As the veins of Copper mountain display the presence of some tourmaline and some fluorite, it appears that there is a good analogy between them and those which have been referred to above. Furthermore, the fact that the copper ore occurs here in pegmatite, rather than in granite, adds to the interest of the occurrence.

The third topic to be set forth, is the presence of gold and platinum in the pegmatite. The pegmatite of Copper mountain deserves additional attention, since it displays a small quantity of native gold, and also a still more interesting mineral, the sperrylite. This arsenide of platinum was first found in 1889 by F. L. Sperry, chemist of the Canadian Copper Company, and was subsequently studied and named by Wells and Penfield. The two minerals occur in flakes in the bornite and in the chalcopyrite. (See Fig. 5.) They also enter the orthoclase, where they form minute particles which give the impression that the two minerals are in the rock as original components.

It has been difficult to determine the sperrylite; but a treatment by various acids gave some particles which preserved the brilliant luster. Furthermore, a small crystal of sperrylite was detected in the middle of a flake of mica (see Fig. 6),

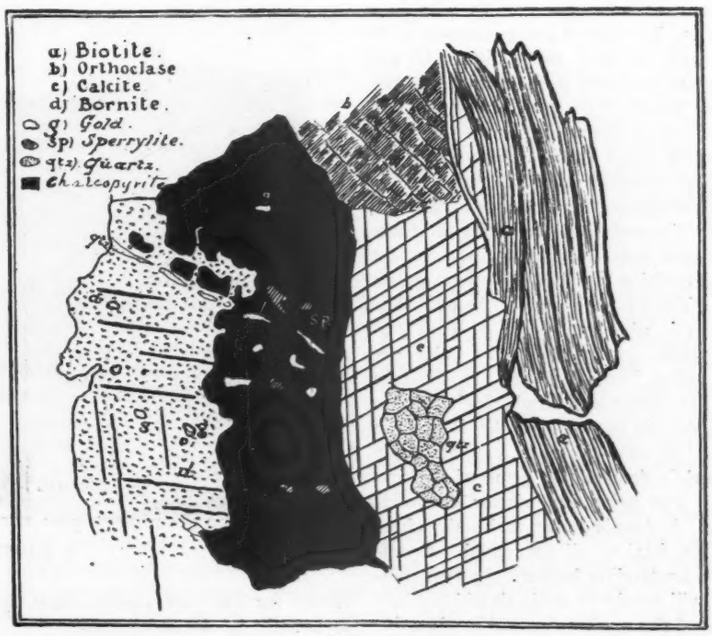


FIG. 5.

where it typically displays the outline of a pentagonal dodecahedron. Pyrite and cobaltite are the only common minerals beside sperrylite which afford this form; but they are so different in other respects from the arsenide of platinum, that no doubt is thrown upon the determination. This fact is important, since it shows that the sulphide of platinum may occur in the same manner that gold does, as in the pegmatite of Passagem (Brazil), which has been described by Hussak. In the present case gold also occurs, which strengthens the analogy between the pegmatite of Passagem and Copper mountain.

The preceding observations can be summarized thus:

(1) The possibility of the alteration of bornite, to chalcopyrite in some ore deposits, as contrasted with the reverse process which is certainly more frequent, and which is termed enrichment.

(2) The occurrence of bornite as an original mineral in a pegmatite dike.

(3) The ocurrence of native gold and sperrylite with the bornite and its associated chalcopyrite, and of sperrylite in biotite. The presence of a platinum mineral in an acidic rock is of especial interest.

A government bureau for the study of alloys would be worth more to the manufacturers in the United States than many of the bureaus now existing.

Despite the large area of the United States and its possessions, the annual production of precious stones is less than a third of a million dollars in value. Tin has not been produced in commercial quantities, and the yearly yield of platinum is measured in ounces. There is but one nickel mine within our borders, and the production of soda is of no commercial importance; but all other important minerals are mined in quantities.

[4] *Zeit. fur Prak. Geol.*, 1896, p. 149.

Kimberley Notes.

By T. Lane Carter.

As the artist breaks his journey when passing through a European art center to see again some great painting, so the engineer, whenever he passes near Kimberley, is tempted to stop over and see what is going on at this great industrial center. Hence these random notes.

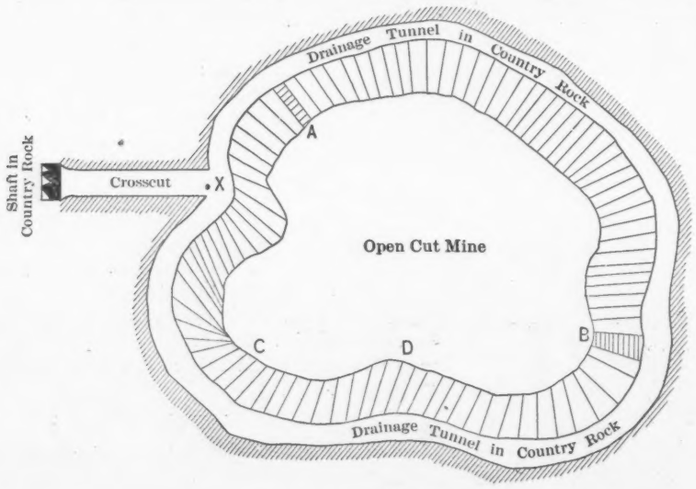


Fig.1

What will be the effect of the Premier (Transvaal) diamond mine upon the future of Kimberley? The views heard at Kimberley are different from the opinions in Johannesburg, where it is declared that the diamond mine in the Transvaal is the greatest in the world. At Kimberley every one admits that the Premier is a big mine, but doubts are expressed as to the quality of most of the diamonds, and they seem confident that Premier will not be able to affect the market for the best stones. At present the Transvaal mine is making large profits. Should a diamond war ever arise, the Transvaal mine will be at a great disadvantage on account of the "diamond law," by which the State gets about half of the profits. So far the competition has had no effect on De Beers. The annual report, to be published next week, shows a profit of £1,981,797 from mining operations. The value per carat varies from 48s. 11.8d., in the case of the De Beers and Kimberley mines, to 29s. 7.76d., in the case of the Belfontein mine. Just now De Beers cannot supply the world's demand for gems of the first water. The price for inferior diamonds is low. A diamond war in South Africa would be fatal to all concerned. A definite understanding between the two companies will surely be made should the exigencies of the market demand it. It is interesting to note that the diamond, which at one time was the most prized gem in the world, now ranks about fourth, on account of the big production of recent years, while the pearl has taken the diamond's place.

I was impressed by the growing use of electricity in the Kimberley mines. Unlike the Rand, the conditions are most favorable for electricity. Kimberley practice is quite up to date. There is a large central power-plant. Save for a small machine, there is not a steam-engine to be seen, steam-turbines being used entirely. Two 1,000-kw. machines are now installed. To meet the growing demand for power, the plant is being increased to a total of 4,000 kw. The De Beers company, besides lighting their extensive works, illuminate the town of Kimberley from the plant, and they will also supply the electricity for the new electric tram system to be built by the municipality.

The foundations of the power station have given some trouble. They were built upon the limestone capping, six or seven feet thick, which is found all over the country. For the new turbines the limestone is being removed, and the foundations will rest on the solid basalt below. Buckets of sand are always ready for use in case a dynamo 'goes off.' With such high voltage it would, of course, be fatal to use water.

The automatic feeders on the Babcock & Wilcox boilers are working admirably. The coal used at present is about the best in South Africa, costing nearly 6os. per ton. With some of the poor clinkering coal we get on the Rand, I fear the success of the feeders would not be so great. On the whole, the turbines at Kimberley seem to be a great success, and the verdict here is the same as that of many other centers, namely, that the modern steam-turbine furnishes the best method of generating electricity. Difficulties, of course, had to be overcome, one of the chief being lubrication. It is very hot in the summer time, and it was found that the oil did not get cool enough. A cooling device has been adopted, and no more trouble is experienced.

The turbines have high-pressure and low-pressure cylinders. The dynamos are of 5,000 volts. Most of the mains are laid underground, thus escaping the mishaps due to lightning. Surface and underground transformers are placed at each mine. The power for pumping, tram cars, etc., is carried into the mine at 5,000 volts. Save for the lights underground, where 110 volts are used, 220 is the working voltage. Although every precaution is observed, the practice of taking 5,000 volts underground is open to debate. There is a risk about it, no matter how perfect the insulation, which in a mine does not remain perfect indefinitely. I believe in some countries the law prohibits the use of so high a voltage underground.

The Dutoitspan mine, which has been idle for a long time, will soon be ready to turn out diamonds again. The equipment is fine. Electric traction is installed

A KAFFIR FAMILY SCENE.

underground. A very large hoisting engine is just finished. It will run on a condenser, and the steam will be superheated. In the boiler-house, mechanical draft, coal feeders, etc., are found. The change-house for the miners looks like a parlor; it is almost as cheap to put in fancy steel ceilings, like those used in drawing-rooms, as to use wood, so that all the rooms have been fitted up with steel ceilings. The lockers for the miners are also made of steel screening, so as to be thoroughly ventilated.

All new underground haulage will be electric, but in such old mines as the Kimberley the present endless-rope haulage will remain. The motive power for driving the long endless-rope haulages on the surface, to take the material to the depositing floors, will be electric.

adopted, and where mud-rushes are almost unknown.

The Kimberley is now the deepest diamond mine in the world, the workings being over 2,000 ft. down. I found the atmosphere of the lower levels rather trying, due more to the moisture of the air than to a high temperature. Natural ventilation is relied upon to a great extent, but when the proposed scheme of artificial ventilation is working, the trying atmospheric conditions on lower levels will disappear.

Working costs at Kimberley are coming down. In the first place, the dynamite factory at Somerset West, 29 miles from Cape Town—which, besides supplying Kimberley, sells great quantities of explosives on the Rand—insures much cheaper dynamite. In two years the coal

but at present the market is limited. The corn used for natives at Kimberley is mostly South African grown, which fetches between 6s. and 7s. per 100 lb. on the Kimberley market.

In spite of the assertion that the Vaal river diggings, just north of Kimberley, are about 'played out,' there are now nearly 1,200 independent white miners scattered over these old workings. The majority of them are not 'making salt.' To show what a gamble the life is, last January, when the river was very low (most of the finds are *now* made in the river bed at low water), a miner found a diamond the day after he started work worth £1,200, while others have been scratching for months and found nothing.

The labor market at Kimberley is glutted. De Beers now has about 2,600 white

SOME KIMBERLEY DIAMONDS.

The first mud-rush for nine years occurred recently at the Kimberley mine, in which seven Kaffirs were buried, four of them being recovered alive after an entombment of 60 hours, while three were killed. It may be of interest to speak briefly of this bane of Kimberley mining. As is well known, all the mines are first worked on the open-cut system for a depth of about 300 feet. Weathering of the enclosing rock goes on; it breaks off and falls into the open-cut. Water runs into these huge openings and, mingling with the fine debris, forms mud; this accumulates until the pressure is sufficient to force the stuff into the workings underneath. Could the open-cut be kept perfectly free of water there would be no such thing as a mud-rush. The scheme adopted by De Beers may be illustrated by a diagram. In Fig. 1, ABDC is a plan of the mine. A tunnel is driven all the way round in the outer rock. A and B are points where small streams of water run down into the open-cut. From these points small tunnels (shown by cross-hatching) are driven to the main drainage tunnel, and the water thus deflected runs into a pumping plant at X. That this scheme has proved efficient is indicated by the Kimberley mine, where it was

bill will be greatly reduced. De Beers is contributing £788,464, the estimated cost for 147 miles of railroad from Klerksdorp, in the Transvaal, to Fourteen Streams, a station on the present railroad north of Kimberley. This will enable De Beers to draw coal from Klerksdorp for one-half the present price. This coal is not as good as Natal Navigation, which costs about 60s. per ton at Kimberley, but it is fair, and the big difference in price will make up for deficiencies. This railroad will be a blessing in many ways. The present long, tedious journey from Johannesburg to Kimberley will be reduced to 12 or 14 hours. Much of the Rand's supplies will come this way, and it will greatly aid in the development of the western Transvaal.

The De Beers company has not gone in for agriculture, but ranching is a side industry, the idea being to feed the 16,000 employees with home-grown meat. So far cattle-rearing has not proved much of a financial success, for it is actually cheaper at present to feed the natives with cold-storage beef than with home-grown meat. This point should be noted by those who recommend an influx of pastoral settlers. That they will be able to compete with the imported beef later on is no doubt true,

employees on the books. A good number are given £3 per week as handy men, but could be dispensed with. The 'out-of-works' is large, but there are not as many idle men as at Johannesburg. There are now about 14,000 native laborers.

Peat in Sweden.

United States Consul Bergh, at Gothenburg, Sweden, translates a few extracts from a leading newspaper, regarding the growth of the peat industry. Official influence is being brought to bear upon the railroads, urging them to adopt the use of domestic peat instead of English coal, whenever this can be done without material loss.

The most actively worked deposit is at Landvetter, on the Gothenburg-Borás railway, to which road 3,000 tons of prepared fuel were furnished during 1904, at a price of 11.60 kronor ($3.11) per ton. The deposit has a workable area of 2,111 acres and is estimated to contain 140,000 tons. The finished product is reported to contain only 2 per cent ash.

An important new source of potash would be available if Clark's method could be applied to orthoclase.

Rousseau on Mines and Miners.

Among the writings of Jean Jacques Rousseau the following, hitherto unpublished, remarks have been found. We translate them as they are quoted in *L'Echo des Mines et de la Metallurgie.* "The mineral kingdom has nothing about it that is lovable or attractive; its riches, enclosed within the heart of the earth, appear to have been put away from the sight of man in order not to tempt his cupidity; they are placed there as though held in reserve against the exhaustion of that true wealth which is at his very door and which becomes distasteful to him as he becomes corrupted.

"Then he needs must call on industry, toil and trouble, to help him out of his misery; he digs into the innermost earth, he goes searching in the very center of it, at the risk of his life and at the expense of his health, for imaginary benefit instead of the real benefits which the earth offered to him when he knew how to enjoy them. He flees from the sun and the daylight which he is no longer worthy to see, he inters himself alive—and in this he does well, for he no longer merits to live in the sunshine. Thereupon, quarries, chasms, forges, furnaces, with their anvils and hammers, with smoke and fire, take the place of the sweet pictures of work in the fields.

"The emaciated visages of the unfortunates who languish amid the infected vapors of mines, of ugly blacksmiths, or hideous cyclops, are the spectacle which mining machinery substitutes in the heart of the earth in place of the verdure of flowers, the blue of the sky, the love-making of the shepherds and the charm of healthy labor, all of which are on the surface."

Nitrate Profits.

The world's consumption of nitrate of soda is now about 1,450,000 long tons per annum, equivalent to 1,349,100 tons of nitrogen. The cost to consumers, principally in the fertilizer, blasting powder, glass and acid industries in 1904, was from $40.26 to $47.96 per ton delivered, which is about $5 more than was paid in the previous year. This increase was not all profit, however, as 15 per cent, or 75c. per ton, represented extra expense of production as the result of higher wages and the reduction in the individual quota of exports to accommodate new *oficinas.* A further 10 per cent, or 50c. per ton, is credited as the advance in ocean freight rates to distributing markets by agreement of ship-owners, and about 12c. per ton was charged to propaganda expenses. These three items absorbed $1.37 per ton, or over 27 per cent of the advance shown in selling prices. Equally interesting is the fact that exporters paid last year an ocean freight averaging $3.96 per ton, in addition to $12.32, the customary export tax collected by the Chilean government, making together $16.28, equivalent to nearly 35 per cent of the c. i. f. selling price. There have been various other expenses incidental to producing and marketing. To convey some idea of the magnitude of the nitrate of soda industry, we append a table showing the financial position of a few of the more important *oficinas.* The figures given cover the fiscal year ending June 30, 1904:

	Net profit.	Dividend, per cent.	Balance forward.
Amelia	£42,820	*Nil.*	**Nil.*
Colorado	15,432	7.5	£26,343
Lagunas Syndicate	85,392	5.0	3,099
Liverpool	39,312	30.0	42,040
London	25,011	18.8	*Nil.*
New Tamarugal	32,589	*Nil.*	*Nil.*
†Pan de Azucar	17,596	12.0	7,571
Santiago	62,727	22.0	157
Santa Catalina	19,827	15.0	2,850
Santa Elena	1,086	1.0	831

*Applied to cancelment of debentures, £33,400.
† Period of 15 months.

In addition to the above dividends, there have been declared by the New Paccha & Jazpampa Company, 19 per cent on its preferred stock, and 15 per cent on the common; San Lorenzo, at the rate of 10 per cent per annum, and Alianza company, 12 per cent. A good proportion of the companies named have shown increased profits, notwithstanding a smaller individual output. It is estimated that the net profits have averaged from $3 to $5 per ton, which, based on the world's consumption, would mean a total of approximately $5,828,000. What has been done with this money may be surmised when it is learned that besides the dividends paid, the Lagunas Syndicate, one of the largest producers, has applied about 17 per cent of its net earnings to the cancelment of debentures; the Santiago, about 21 per cent, and the Santa Catalina, 28 per cent, and others proportionately. Favor is shown to the policy of providing a certain proportion of net earnings annually for interest and redemption of debentures, which in part explains why no large amounts are added to the reserve fund account. Substantial provision, however, is made for depreciation in plant and property, the 5 per cent statutory reserve is maintained, and recently not a few companies have established an insurance fund for goods in transit. In cases where virgin nitrate land was purchased in Tarapaca, either for the purpose of rehabilitating the prestige of certain of the older *oficinas,* or by newer operators who make the venture on prevailing high prices for nitrate of soda, systematic payments will be made extending over several years.

To forecast future prosperity, cognizance should be taken of the fact that, although the combination of producers may be renewed for another five years from 1906, when the present agreement expires, high prices may have a contrary effect on consumption. Sulphate of ammonia is the competitor of nitrate of soda, and it would seem advantageous to keep prices at such a point as not to discourage the consumption of the European beet-sugar planters, who are the largest individual users of nitrate of soda. True, the Nitrate Producers' Propaganda Committee is spending money in newer fields, especially in America, hoping to make up the deficiency in some of the older consuming territories. Incidentally it should be remembered that the new nitrate deposits in California may be developed in the not distant future.

A Barytes Plant.

The new plant of the W. D. Gilman Company, at Sweetwater, Tenn., consists of a building 60 by 190 ft. in size, and 40 ft. high. A side track of the Southern railway runs up to the building, and is equipped with a track scale and elevators for loading the clean barytes and barium sulphide into the cars. At the south end of the building is a crusher and grinding room, where the barytes and coal are prepared for the furnaces. From this room the mixture is carried by conveyors to storage bins located over the furnaces. It is charged from these bins as required. The furnaces are of the usual revolving type, and have a capacity of 20 tons per day. The product is discharged automatically, while still red hot, into iron cars, which are hauled away to the storage room, where they are dumped. When cool, the product is loaded into cars on the side-track for shipment. This furnace product contains 65 to 70 per cent of barium sulphide, and 15 to 20 per cent of barium carbonate, the residue consisting of unconsumed coal, ash and silica. The conversion of barium sulphate is almost complete. This crude sulphide finds a ready market for the manufacture of lithophone and the chemical salts of barium, of which chloride and nitrate are most in demand. The cheapness with which the ore is mined, and coal obtained in the district, make it possible to manufacture the sulphide and deliver it in New York, at a lower price than it can be made there.

The department for cleaning and bleaching mineral for the production of ground barytes contains a large crusher of the Blake type. From this the mineral goes to a table where it is passed over a magnet to remove iron, and thence it is carried to a washer which frees it from clay. From the washer it goes to the rougher and cleaner, after which it is ready for the bleaching tanks, where it is treated with acid and steam in the usual way. The output is 30 tons a day.

Barytes in the Sweetwater district seems especially adapted to grinding, as it is very pure and soft. So far, it has improved in whiteness as the mines go down deeper. The greatest depth yet attained by any working in this field is about 100 ft.

The success of a coal mine depends in a large measure upon underground costs.

Gold Mining in French Guiana.

By David E. Headley.

The discovery of gold in French Guiana was made in 1853 by one Iaoli, a Brazilian, and the pleasure felt by the Cayennese at the discovery is shown by the name given to the locality, Montagne Impératrice.

Since the first discovery the production of gold has been maintained steadily. The work has been done mostly by placer-washing. Quartz-mining has been attempted in several instances, but, with one exception, it cannot be said to have met with any success. Dredging has also been tried in a few of the rivers, but with disappointing results, caused more by lack of experience than the poverty of the river gravel.

ST. LAURENT DE MARONI.

The industry may be said to be advancing, literally. When any new discovery is made, workings are immediately abandoned all over the rest of the colony; the miners fairly flock to the scene of the reported discovery. Those who are directly interested are divided into two classes; the placer owners and the roving bands known as 'marauders,' a term which defines both their character and methods. The only claim allowed the discoverer is the amount of land that he has been able to clear of undergrowth before the others arrive. These marauders are treated liberally by the merchants, who usually give large credit on payment of 30 per cent of the cost of goods. I was surprised to find that this system of credit is maintained by good faith. Another procedure followed by some of the more crafty shopkeepers is almost identical with 'grubstaking' in the western States.

In the early days of placer working the miners were chiefly East Indians; the men received 10c., and the women 6c. per day, the other laborers 20c. per day. The cheapness of labor and the richness of the finds made the extraction of gold highly remunerative; but these prices have been advanced. Now the laborer, on his first trip, gets 50c. per day, and later this is raised, perhaps doubled; the women receive 25c. per day. Here, unlike the conditions in the other Guianas, a large percentage of women constitute the working gang, but the tasks given them are never onerous. The captains and boat-hands are paid six or eight francs and four or five francs, respectively, per day. The majority are skilful in the management of their boats, but are lazy and intemperate.

Foodstuffs are plentiful, a large proportion being imported from the United States.

Transport from Cayenne to the different rivers is extremely slow and uncomfortable, being effected solely by small sloops; some of these have a capacity of only 20 tons. On the rivers, boats can be hired at the rate of four to five francs per day, with the additional cost of boat-hands.

SPAROUINE CREEK, MARONI DISTRICT.

Transport can be said to be cheap; that is, in normal times, but it is managed peculiarly. A placer owner engages a captain, who in turn engages a boat-hand, a contract being made at a rate per barrel; the captain generally takes about 20 barrels and about eight laborers on his voyage. But the captain and the one boat-hand alone work the canoe, while the laborers sit and watch. In addition to other vexations, this means that, owing to the long voyage, a large percentage of the laborers fall sick, and can only work after a rest of some days. However, in the Oyapoc river, where the boats are properly manned, they make the journey in eight to ten days, a trip which, in other rivers under the conditions indicated above, would take fully 25 days. All this could be remedied and transport rendered cheap if the matter were looked after by the Government, and if small steamers were run from Cayenne to the different rivers.

The mining regulations are peculiarly one-sided, as the following illustration shows. Suppose a man makes a rich find and has not the necessary cash to procure the land and pay surveyors' fees. Someone else gets an inkling of the matter and employs a private surveyor to make a chart of the district, with directions intentionally vague. He applies to the government for several thousand hectares of land, no matter how vague the location may be. He then sends up a surveyor, who generally succeeds in 'spotting' the district, and the poor miner is robbed of his find. Hardship is also brought about by the government not allowing any one but a surveyor to mark boundaries. It means that the poor man in every case is denied an opportunity to help himself. Another peculiarity is that the government issues thousands of petty concessions, with pretty charts which show lands in the interior, but which are rarely well defined. This in turn favors the wandering marauders. Moreover, one is forced to pay 10 fr. per kilogram on all gold won, and 8 per cent export duty. Also one is compelled to pay 10 fr. per kilogram to the sloop that takes it to Cayenne, in which case a box containing 300 kilograms would cost 300 fr., for what under other circumstances would only cost 2 fr. The other regulations are just as extortionate and need no comment.

The Maroni River.—This is the largest of the Colony's rivers, and has given the best returns. A great deal of successful alluvial mining has been done here for a number of years, and is still being largely

prosecuted. Quartz mining and dredging were unsuccessful.

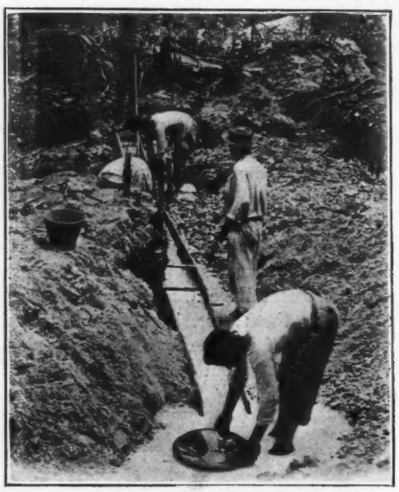
Mana River.—This river ranks as the second in the production of gold. Among the large placers that formerly existed and have later suspended operations is that of Enfin, which was exploited for about 30 years, giving an average yield of 100 kilograms per month, with not more than 200 men. It is now being worked by marauders. There is no doubt as to the occurrence of rich quartz veins in the neighborhood. I have seen numerous rich samples, containing visible gold, that have been broken from the outcrops of veins scattered over the country.

Sinamary River.—This river, in which the French made their first settlement in 1620, unlike the others, does not appear to be auriferous, except within an area 20 miles square. Within this area is situated the celebrated placer St. Elie, which has been working continuously for more than 30 years, and has given its 100 to 150 kilograms per month with an average gang of 250 men. Both quartz mining and dredging were attempted on a small scale, but unsuccessfully.

Appronague River.—It is on this river that the precious metal was discovered about 50 years ago by a Brazilian named Paoli. The deposit must have been very rich, for as much as five kilograms per day were taken out by a sluice, operated by 20 men. This was continued for a long time, but owing to two serious landslips, which killed 60 and 100 men, respectively, the mine was shut down by the government. The branches of this river have been worked in almost every direction, from its mouth to its source. The Materony company, on Iponcin creek, has been the largest concern; the staff consisted of a manager, assistant manager, 20 overseers and a doctor, with a gang of 700—all East Indians. The men received 10c. and the women 6c. per day, respectively. The placer gave an average yield of 80 kilograms of gold per month for a long time, and it is still being worked by small companies, which pay 10 per cent on all gold won.

Recapitulation.—During my prospecting for diamonds in the colony I have had an opportunity of going over a large tract of country, and, from what I have seen, I do not doubt the richness of the gold-fields. Outcrops of veins can be seen on every hand, carrying visible gold. In the Appronague, it is especially so at the Materony company's concession; also at placer Souvenir, on the Manas lead. On both of these concessions I have found platinum; the samples of auriferous black sand sent from Appronague assayed about 10 grams per ton. Samples from the Souvenir placer showed more than 140 grams to the ton. The assays were made by Baker & Company, of New York. At Comti river I opened a vein which has a width of 15 ft., and runs about 30 dwt. per ton, and on the surface there are thousands of tons of the outcrop, which assay equally well. This property is only 87 km. from Cayenne, and can be reached by steam launches in all seasons.

Everywhere a granitic formation appears in the principal mountain ridges of the colony. Here and there gneiss can be seen, but not abundantly. Auriferous veins occur in the clay slates, which are so metamorphosed that all traces of fossils have been obliterated. Only small outcrops of sandstone show, this being due, no doubt, to the tremendous erosion; but in the highlands between the sources of the Appronague and Mana rivers sandstone can be seen, together with shale and conglomerate. Either east or west of the watershed the granitic formation appears, with diorite, diabase and clay-slate, the



FREE MINERS ON THE MARONI.¶

latter being accompanied by large deposits of iron ore.

But little French capital has been invested here. It appears that this is largely due to the belief of the mother country that Cayenne is only a penitentiary, a fit home for criminals; capitalists are therefore somewhat reluctant to interest themselves. What the colony needs is liberal mining laws and the aid of the government in facilitating ingress to and egress from the fields. The present policy seems to be one of total indifference. If this is continued widespread depression will surely follow.

The chemical industry in Japan is in a flourishing condition, supporting about 840 factories, which employ 38,591 men and women. There are no less than 79 government laboratories, whose duty it is to ascertain and impart the methods of utilizing the numerous varieties of seaweed and other fishery products, which are so plentiful in Japanese waters. Foreign chemists will not find this an attractive field, as a number of Japanese have already been educated in Europe or at the high schools in Tokio or Kioto.

The Andrew Carnegie Research Scholarship.

Mr. Bennett H. Brough, secretary of the Iron & Steel Institute, gives notice that applications for this year for the Carnegie research scholarship must reach his office, No. 28 Victoria street, London, by the end of February. The scholarship is awarded annually on the recommendation of the Council, and there is no limitation as to sex or nationality; candidates, however, must be under 35 years of age.

The object of this scheme of scholarships is not to facilitate ordinary collegiate studies, but to enable students, who have passed through a college curriculum or have been trained in industrial establishments, to conduct researches in the metallurgy of iron and steel and allied subjects, with the view of aiding its advance or its application to industry. There is no restriction as to the place of research which may be selected, whether university, technical school, or works, provided it be properly equipped for the prosecution of metallurgical investigations.

The appointment to a scholarship is for one year, but the Council may at their discretion renew the scholarship for a further period instead of proceeding to a new election. The results of the research must be communicated to the Iron & Steel Institute in the form of a paper to be submitted to the annual general meeting of members, and if the Council consider the paper to be of sufficient merit, the Andrew Carnegie gold medal will be awarded to its author. Should the paper in any year not be of sufficient merit, the medal will not be awarded in that year.

United Engineers Building.

At the meeting of the Conference Committee on the United Engineering Building, held Jan. 7, Mr. Alfred R. Wolff was unanimously appointed consulting engineer for the heating and ventilation of both the United Engineering Building and the Engineers' Club, to be erected on 39th and 40th streets under the Carnegie gift of $1,500,000. Mr. C. O. Mailloux was selected as the consulting electrical engineer for the building, and the firm of Bates & Neilson were selected as consulting electrical engineers for the Engineers' Club. All these gentlemen are well-known in connection with the execution of large work of the class named in New York and vicinity, in addition to which they are prominently identified with the organizations that will occupy the buildings in question. Mr. Wolff and Messrs. Bates and Neilson are also members of the Engineers' Club of some years' standing, and Mr. Putnam A. Bates was for a long time district engineer for all the Crocker-Wheeler installations in the New York territory.

An Electric Hoist at a French Colliery.

An electric hoist of a novel type, which has recently been installed at the Lallemande colliery, owned by the Compagnie des Mines de Ligny-les-Aire, is described in the London *Iron & Coal Trades Review*. The plant was supplied by the Lahmeyer Electrical Company, of London. It is intended to raise 105 tons of coal per hour from a depth of 1,412 ft., at an average speed of 26 ft. per second. Each of the cages has four decks, and, as the net

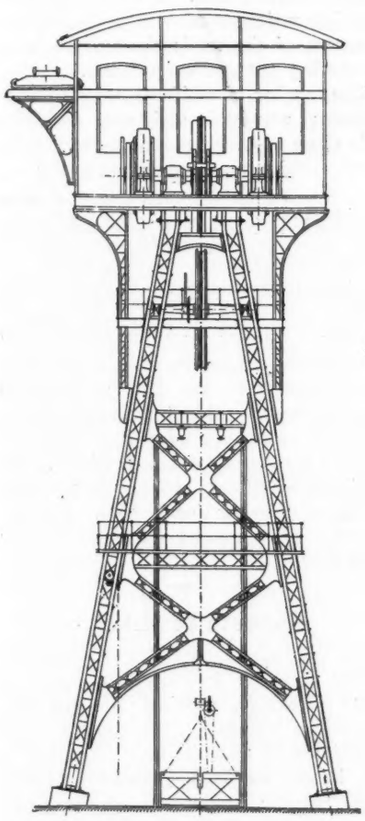


FIG. 1. HEAD-GEAR AND HOIST.

weight carried on each deck is about 1,200 lb., the total load per cage is 4,800 lb. The average time consumed in loading and unloading is 15 seconds, and the trip takes about 1 minute; so that, when running at full speed, about 48 trips an hour can be made.

The hoist is mounted on the head-frame, directly over the shaft, at a height of 69 ft. above the ground level (Fig. 1). This arrangement was selected chiefly in order to economize space. In reality, the head-frame has been so carefully designed that it is but very little heavier than ordinary frames, the weight being about 120 tons. At the same time, this method of carrying out the installation has saved the cost of an ordinary engine-house and foundations.

The main design of the head-frame was planned by the makers of the winding gear, the details being carried out by the Société des Etablissements Metallurgiques d'Onnaing. The four legs of the frame are straddled in the form of a pyramid, fitted with cast-iron feet, and are connected at the top by the main girders of the hoist platform. The feet are placed at the corners of a square, 29½ ft. each way, the center of this square coinciding with the center of the shaft, and all four are solidly anchored to a brickwork foundation. The legs are open lattice girders, with angle-iron corners, and are tied at various levels by lattice cross-girders, with intermediate X-struts, also of lattice work, the whole being thereby made rigid. The height of the engine shaft-center is 70½ ft. above the lower bank, ground level. The engine stage measures 22 ft. by 28¼ ft., the driver's house being mounted on an extension, 8½ ft. by 10 ft., at one end. This house contains the controlling levers, measuring and safety appliances, etc. A second stage, 14 ft. below the first, supports the counter pulley of the hoisting gear, the mechanism actuating the depth indicator, and the controller, the last named being enclosed in a glass case.

The hoisting gear is of the Koepe type, and the main pulley is 13 ft. in diameter. In order to separate the two ends of the rope to a distance corresponding to the distance between the cage centers, 3½ ft., a counter pulley (also 13 ft. in diameter) is provided, and this is mounted on the lower stage, in the same vertical plane as the main pulley. The round steel winding rope is 1⅛ in. in diameter, and a balance tail rope is attached to the floor of the two cages. Each of the pulleys has two grooves, the one for use in winding, the other serving as an auxiliary during the changing of the hoisting rope.

The main Koepe pulley is mounted on two bearings, the shaft being coupled direct to two continuous-current motors, with an aggregate maximum power of 500 h.p. The motors are coupled to the two ends of the pulley shaft, one on the right the other on the left. In hoisting coal, the motors run at a speed of 38 revolutions per minute, in order to produce a cage velocity of 26 ft. per second, this speed being reduced to 19 revolutions when men are being raised or lowered (cage velocity, 13 ft. per second), and to three-quarters of a revolution during inspection of the shaft (cage velocity, 10 in. per second).

At starting the maximum effort is about 600 h.p., decreasing to 300 h.p. during the cage trip and to nothing at the stops. To nullify the effect of these fluctuations at the primary station, a buffer set of motors has been installed at the central, this set assisting at starting, governing the main engine, and equalizing the load on the generating station, so that the latter is only called on to supply a constant force of about 300 h.p., as though actuating a continuous motor. This buffer set is constructed according to a recent Lahmeyer patent, and consists of a starting dynamo, *A* (Fig. 2), a buffer motor, *P*, and a supplementary motor, *Z*, all three being mounted on a common shaft, which also carries a flywheel, *S*.

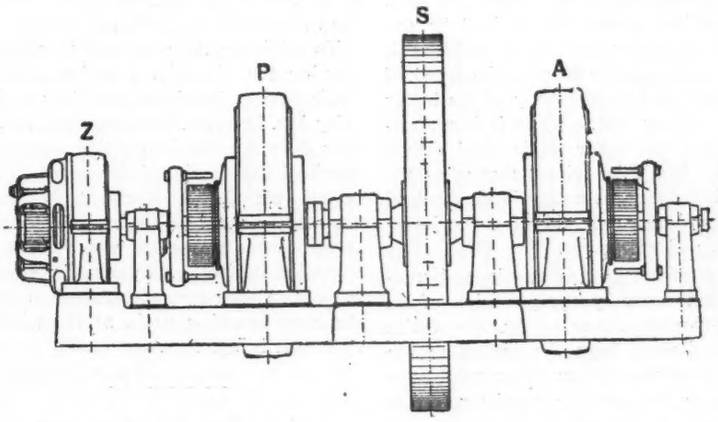


FIG. 2. BUFFER-SET AND MOTOR.

When the hoisting motors are at rest, the starting dynamo—which is in series with the circuit—develops the same voltage as the primary station, but in an opposite direction, the consequence being that the voltage at the terminals of the winding motors is reduced to zero. At the moment of starting the cages the excitation of the starting dynamo is lessened, so that the tension at the terminals of the winding motors is increased, and the latter begin to run, their speed increasing in proportion as the excitation of the starting dynamo diminishes. When this voltage has been reduced to zero the velocity of the rope attains to half its normal value. From this point onward the excitation of the starting dynamo is reversed, its voltage begins to supplement that of the circuit, and in this manner the total voltage is raised to 1,050 volts (525 volts for each motor), whereupon the velocity of the hoisting rope attains the maximum.

It is therefore evident that the governing is entirely effected in the excitation circuit of the starting dynamo, that is to

say, in a circuit traversed by a current of insignificant intensity. The regulator, with its resistances, takes the form of a controller, and is mounted on the lower stage of the head-frame. It is actuated by the starting lever on the upper stage. As already mentioned, the starting dynamo is actuated by a buffer motor, coupled up with the primary station circuit in the ordinary manner. The supplementary motor, *Z*, is in series with the buffer motor, and is fitted with a regulator in its excitation circuit. When the voltage of this latter motor supplements the voltage of the main circuit, the tension at the terminals of the buffer motor increases, and, consequently, this motor runs at an increased speed. If, on the other hand, the voltage of the supplementary motor is subtracted from that of the main circuit, the speed of the buffer motor is reduced. Intermediate speeds are obtained by setting the regulator accordingly, and by this means it is possibly to vary the speed of the motor, and consequently of the buffer set, by 30 per cent. When it is remembered that the buffer set is fitted with a flywheel, it will be evident that when the speed is reduced the energy in the flywheel will be liberated in aid of the primary station, and *vice versa*.

The regulator already mentioned is rendered automatic by the provision of an electro-magnet traversed by the entire current flowing from the central to the winding motors. When this current commences to increase, the regulator lowers the speed of the buffer group, and *vice versa*. This arrangement enables the energy of the flywheel to be brought into play, with the result that the load on the primary station remains constant, whatever the position of the winding motor. An electro-mechanical brake is provided for stopping the buffer set and acts automatically in the event of anything going wrong with the bearings of the buffer set.

The main brakes of the winding gear are double and are fitted with cheeks. They act on the main Koepe pulley and are normally kept out of action by a counterpoise. This latter can be raised by an electro-magnet, the excitation of which can be controlled by means of a regulator in the circuit. The regulator, in turn, is controlled by a brake lever. Should the electro-magnet get out of order its functions can be discharged for the time being by a hand winch.

The position of the cages in the shaft at any moment of the trip is shown by a depth indicator, which also acts as a safety appliance. To prevent any slipping and consequent error it is actuated by a train of cone wheels and rods, set in motion by the counter-pulley shaft. The indicator is connected mechanically with the starting lever of the winding gear. As the cage approaches surface the indicator comes into action by first sounding a signal bell, then automatically pulling back the starting lever, and finally setting on the brakes, all being effected automatically. If this apparatus gets out of order overwinding is prevented by means of a special electrical device for that purpose. In order to prevent rough shock this device does not cut off the whole of the current, but only the insignificant current in the coils of the automatic apparatus, which in turn cuts off the full current, whereupon the electro-magnet attracting the brake counterpoise is de-magnetized and the brakes come into action.

In front of the driver is a third lever, called the safety lever, which, when moved in the slightest degree, cuts off the current and releases the brakes, stopping the engine almost instantaneously. When the cause of the stoppage has been removed, the operator takes off the brakes by means of the hand winch, and returns the safety lever to its first position.

To minimize the wear and tear due to starting too abruptly, a series of automatic devices has been provided; a time relay has, however, been attached, so that they do not come into action unless the overload has continued for more than a certain period. A Karlik tacheograph, actuated by the main shaft of the winding motor, traces a diagram which serves to control the driver. All parts of the winding engine have been constructed to stand the same breaking strain as the winding rope, that is, 650 tons.

Lake Iron Ore Movement.

The dock statistics of the Lake Erie ports for the past season are of interest, as showing the course of the iron ore movement to the furnaces where it is consumed. Between 80 and 85 per cent—last season 84 per cent—of the iron ore shipped from the Lake Superior region goes to the Lake Erie ports, the balance being received chiefly at Milwaukee and South Chicago. The following statement gives the movement for the season of navigation, as shown by the port returns:

	Tons.
Stock on docks, May 1	4,334,103
Receipts at Lake Erie ports	17,994,598
Total supply	22,328,701
Stock on docks, December 1	5,669,895
Movement to furnaces	16,658,806

In the corresponding period of 1903, the movement to furnaces was 16,903,013 tons, so that the decrease was only 244,207 tons. The direct shipments to furnaces were 93.6 per cent of the receipts in the season of 1904, while in 1903 they were 86 per cent.

The receipts at the principal Lake Erie ports in 1904 were as follows: Conneaut, 4,083,655 tons; Ashtabula, 3,639,250 tons; Cleveland, 3,434,012 tons. The receipts at the other ports were: Buffalo, 1,665,917 tons; Erie, 1,284,778; Fairport, 1,157,858; Lorain, 972,931; Toledo, 508,793; Huron, 231,364; Sandusky 48,356 tons. This statement does not include the receipts from the Michipicoten range in Canada, which sent 76,606 tons to the United States.

Coal Mine Accidents in Illinois.

The preliminary report of the Illinois Labor Commission states the number of men employed in the coal mines of the State at 54,774 during the fiscal year ending June 30, 1904. Of this number, 37,987 were classed as miners; 9,812 as other employees underground; 1,562 as boys, and 5,413 as surface men. The entire number working underground was 49,361, or 90.1 per cent of the total; the surface labor numbering 5,413, or 9.9 per cent.

The number of accidents reported is as follows: non-fatal accidents, including only those cases where men were disabled from working for a month, or more:

	1903.	1904.	Changes.
Fatal accidents	156	157	I. 1
Non-fatal	410	507	I. 97
Total casualties	566	664	I. 98
Deaths per 1,000 employees	3.13	2.87	D. 0.26
Injuries " " "	8.23	9.26	I. 1.03
Total	11.36	12.13	I. 0.77

There was a large increase in the number injured. Of the fatal accidents in 1904, there were 148 underground and 9 on the surface, showing averages of 3.00 and 1.64 per 1,000 employees respectively. The total number of men reported in 1903 was 49,814, or 4,960 less than in 1904. This accounts for the relatively lower rates per 1,000 men.

Amber in Dominica.

An American company has recently exploited an amber deposit on the island of Santo Domingo, province of Santiago, Dominican Republic. The locality is at an altitude of 1,800 ft., near the top of a hill known as Palo Quemado (Burnt Post), at the headwaters of the Licey river, on a small branch of the Miguel Sanchez. It is situated about 30 miles inland from the coast, and lies some 10 miles northwest of Tambonil and 7 miles north of Santiago. The amber occurs in a friable, disintegrated, and much broken sandstone, which at times becomes a conglomerate and contains fragments of lignite. The pebbles of the conglomerate are chiefly silicious, of varied colors, some of white quartz, well rounded, 2 or 3 in. in diameter, and smaller ones of rich red jasper. The amber itself is found loose in the soil and disintegrated rock, and also in the friable sandstone. It appears usually in ovate masses, from an inch or two to the size of a man's hand, round, sometimes flattened, dull on the exterior, and covered with a brown surface crust, like much of the Baltic amber and like buried resins generally. It possesses somewhat of the opalescent character of the beautiful amber from Roumania, and of that from Catania, Sicily. In color it varies from yellow to rich brown.

Books Reviewed.

Geological Survey of Ohio. The Uses of Hydraulic Cement. By Frank Harvey Eno, Columbus, Ohio; Published by the Survey. Pages, 260; illustrated.

This is a valuable contribution to what is often called an age of cement construction. The volume opens with a preface on administrative detail by the State geologist, Edward Orton, Jr. The book proper is written with a broad optical angle, opening with a historical abstract of the history of the cement industry, and following this with special chapters on the use of cement in mortar, in concrete, and in reinforced concrete.

There is a valuable chapter on specification for concrete materials and structures; and one on machinery and tools used in cement making and placing. The book is fully illustrated with cross-sections, ground plans, and half-tones. Though the material and treatment are strictly technical, yet it reads with fascination. Foundation, wall, pillar, lining, chimney and bridge, are made of concrete. The book tells how this is done, and is worth owning.

Techno-Chemical Analysis. By Dr. G. Lunge. Translated by Alfred I. Cohn, New York; John Wiley & Sons. London; Chapman & Hall, Ltd. Pages, 144 illustrated. Price, $1.

This little volume is from the pen of the venerable analyst at Zurich, who is probably universally regarded as the leader of technical chemists the world over. The 'Contents' opens with brief remarks on preliminary sampling and weighing, followed by special chapters on gas analysis, fuel, water, and the general topics of the commercial products connected with acids, alkalies, cement, coal-tar, mineral oils, soap, sugar, brewing, tanning, dyeing, etc.

Obviously no one book, to say nothing of a small one, can cover well so wide a scope; but this book is rather a timely list of notes on new or standard methods, and new points and devices; and it is this feature which makes it indispensable to every overrushed worker, who will find some fact which he needs now. Among the many items may be emphasized: titration methods for absorbable gases, water hardness, electrolytic lyes, coal-tar, and mineral oils. The translation and the printing are well done and the publishers are to be congratulated in their prompt service to the commercial chemist.

Die Erzlagerstätten. Part 1. By A. W. Stelzner. Revised by Alfred Bergeat. Leipzig, Germany; Arthur Felix. Pages, 488; illustrated. Price (in New York), $4.50.

This learned, but bulky, volume on ore deposits, is a systematic treatise, made up by the editor, from the posthumous manuscripts and lecture notes of the lamented Freiberg professor, who died in 1895. The subject is divided under the following heads: (1), The eruptive deposits; (2), the stratified (sedimentary?) deposits; (3), the fissure-filling; (4), the core-filling; (5), the metasomatic deposits; (6), the metathetic deposits, (eluvial marls); (7), alluvial deposits. Of these divisions, only the first, and part of the second, are treated in this volume. The eruptive deposits, in 65 pages, cover oxides (including tin, magnetic and titaniferous iron and chromite); sulphides (including cobalt, nickel, copper, etc., in the gabbros); native metals; and halogen- and oxygen-salts. A supplementary chapter considers diamond in peridotite. The stratified deposits, comprised in the remaining (380) pages of the volume, include the oxidized iron and manganese ores and the sulphide ores. The latter are grouped under the following: (1), Tetrahedrites; (2), pyrite, galena and blende beds; (3), auriferous, pyritic tetrahedrites; (4), copper and related deposits; (5), lead-, copper-, and silver-bearing sandstone; (6), copper-bearing tuffs. The volume continues with a short (14 pages) chapter on the stratified phosphate deposits and concludes with the opening chapter on the stratified sulphide deposits. In such a case as this, comment is superfluous beyond the statement that the volume is one to be rated with only the classical authorities on the subject of ore deposits. It is characterized by German copiousness, and is a storehouse of fact and bibliographic reference. The second and concluding volume will appear shortly.

Iowa Geological Survey. Volume XIV. Annual Report for 1903, with Accompanying Papers. Samuel Calvin, State Geologist. Des Moines, Iowa; published by the Survey. Pages, 664; with maps and illustrations.

The volumes issued by the Iowa Geological Survey constitute a valuable record, and the present one is no exception. It contains the administrative report, showing the work done by the Survey during 1903, both in field and office, and that planned out for the succeeding year. This is followed by a report on the mineral production of the State, by S. W. Beyer. The chief values in this production are found in coal, clay, building-stone and gypsum. To these are added a small quantity of lead and zinc ore from the district around Dubuque, and a few thousand tons of iron ore. The other papers in the volume are a long and valuable one on the 'Technology of Clays,' by S. W. Beyer, and I. A. Williams. A paper on the 'Chemistry of Clay' follows; this is the work of Mr. J. S. Weems. Some 30 pages are given up to a paper on the 'Selection, Installation and Care of Power Plants,' which is intended chiefly for the use of clay-workers. The 'Geology of Clays' is treated in a separate paper by S. W. Beyer and I. A. Williams, and the technical papers conclude with one on 'Tests of Coal Products,' by A. Marston. A supplement contains a directory of the clay-workers of the State, while another one gives in detail the mineral production for 1903, including the output by counties.

It will be seen that, outside of the statistical portion, this report is devoted entirely to the clay resources of the State and the coal industries. In view of their importance to the State, this is a judicious choice of subject, and the volume will be a valuable one to those who are engaged in developing the resources of the State.

Geological Survey of Georgia. A Preliminary Report on the Coal Deposits of Georgia. By S. W. McCallie. Atlanta, Ga.; State Printer. Pages, 124; illustrated.

The coal deposits of Georgia are found mainly in the northern part of the State, adjoining the Tennessee boundary. They have been worked to some extent, but the total production of the State is small, as compared with that of Tennessee and Alabama. The Carboniferous formation runs diagonally across the northwestern part of the State, being bounded roughly on the East by the Oostanaula river for about half the distance, and for the remaining half by the line of the old Western & Atlantic railroad. On the South the formation does not extend beyond the Coosa river. Mr. McCallie has made an interesting report, the first chapter describing generally, the Carboniferous rocks of the State; the second relates to the topography, which is typical of the Cumberland plateau region of Alabama and Tennessee. The distinguishing physiographic feature of the area is the broad mountains, more or less flat on top, with precipitous marginal cliffs, rising from 800 to 900 ft. above the valleys. Two of these mountain ranges traverse the northwestern corner of the State, through the entire Carboniferous region; one being Lookout mountain, which is the higher of the two, and also the narrower, while the other is known in different localities as Sand mountain and Raccoon mountain, the latter being the southern extension of Walden's ridge. From the Georgia-Alabama State line, northeast, for some distance, the surface of Raccoon mountain is comparatively level. Further north, however, it is deeply indented by the Nickajack gulch, and loses, in great measure, its plateau character, breaking up into irregular ridges and hills. The third chapter describes the structural geology of the coal-fields. The report then takes up the coal deposits in detail, describing in successive chapters, those of Walker, Chatooga and Dade counties, including some account of the individual workings. The seventh chapter treats of the correlation between

the Upper and Lower Coal Measures, and the final chapter gives a number of analyses of Georgia coals. The most important workings in the State are the coal mines and coke-ovens of the Georgia Iron & Coal Company, in Dade county, where a considerable quantity of coal has been mined. There is still room for a good deal of development in the Georgia mines.

Books Received.

In sending books for notices, will publishers, for their own sake and that of book buyers, give the retail price? These notices do not supersede review in a subsequent issue of this JOURNAL.

United States Geological Survey. The Production of Gold and Silver in 1903. Washington; Government Printing Office. Pages, 44.

Iron and Steel Institute. Visits and Excursions at the American Meeting, 1904. Bennett H. Brough, Secretary. London; published by the Institute. Pages, 104.

Modern Industrial Progress. By Charles H. Cochrane. Philadelphia and London; the J. B. Lippincott Company. Pages, 648; with 400 illustrations. Price, $3, net.

Report of the Commissioner of Fisheries for the Year Ending June 30, 1904. George M. Bowers, Commissioner. Washington; Government Printing Office. Pages, 168.

South Carolina Geological Survey. Preliminary Report on the Clays of South Carolina. By Earle Sloan, State Geologist. Columbia, S. C.; State Printers. Pages, 176; illustrated.

Western Australia Statistical Register. 1902. *Part VII. Mineral Statistics and Water Conservation.* Compiled by the Government Statistician. Perth, W. A.; Government Printer. Pages, 40; with diagrams.

Comparative Statistics of Lead, Copper, Spelter, Tin, Silver, Nickel, Aluminum and Quicksilver. Compiled by the Metallgesellschaft and the Metallurgische Gesellschaft, A.-G. Frankfort-on-Main, Germany. Pages, 68.

The Geological Relations of the Old Granite to the Witwatersrand Series. By G. S. Corstorphine. Johannesburg, Transvaal; reprinted from *Transactions* of the Geological Society of South Africa. Pamphlet, 8 pages; illustrated.

The Baldwin Locomotive Works, of Philadelphia, the largest locomotive plant in the world, during 1904 turned out 1,453 locomotives. Of that number 1,352 were operated by steam, 94 by electricity, and 7 by compressed air. Compared with 1903, this was a reduction of nearly one-third, the number in that year being 2,022, the largest production in the history of the works. Of the locomotives turned out in 1904, 286 were sent to foreign countries.

Correspondence.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.

Letters should be addressed to the Editor.

We do not hold ourselves responsible for the opinions expressed by correspondents.

Mining Finance.

Sir—I quote from the editorial in your issue of December 8, 1904, entitled 'The Logic of Valuation': "In the first place, an investment in a well developed copper mine should yield 10 per cent; secondly, 5 per cent should be set aside for a sinking fund to redeem the principal. By the annuity tables, it is found that, assuming ten years' life for the mine, the number of years' purchase of dividend to yield 10 per cent income and redemption of principal at 5 per cent compound interest is 6.14 years. This 6.14, multiplied by the annual dividend—$4.80—makes $29.47, say, $30, which is the amount that should be paid per share to give the purchaser 10 per cent income, and return to him, at the end of 10 years, the price which he paid for the share."

I encounter this question of "so many years' purchase, at so much income, and redemption of principal at a certain interest," very frequently; and I am free to say that it is obscure to me, though I have no doubt it works out in a very simple form. As a matter of fact, this whole matter of capitalization of a debt, annuity, etc., amortization, number of years' purchase of dividend, sinking fund, and annuities, is only vaguely understood by me, and I should like to obtain some convenient manual whereby I can post myself thoroughly. Can you recommend anything on the list of works handled by your JOURNAL that will fill the bill?

There may be others among your subscribers whose experience with financial questions of this particular nature is as limited as mine; and if you would elucidate the point mentioned in your editorial, you would confer a favor on us all.

E. H. W.

Parral, Mexico, Dec. 19, 1904.

(The amortization of capital invested in equipment as related to the decreased cost attained by such additional machinery, has been discussed in this JOURNAL by several writers, notably, Mr. H. C. Hoover in our issue of March 24, 1904. A discussion ensued, and to this our correspondent is referred. Amortization is the recovery of capital invested, at the end of a certain term. Number of years' purchase means the number of annual profits which together represent a return of the capital; a mine sold for $100,000 is bought at five years' purchase if it yields $20,000 profit per annum. The question of life and return of capital on the basis of an annuity is a more complicated question. In 1811 Inwood's tables were first published; they give the present value of an annuity of different rates per cent for any number of years and replacement of principal on termination of the annuity. What immediate lump sum must one pay to receive $25 annuity and have the money paid for the annuity replaced at the end of 25 years? The tables in question give the answer in the form of the number of years' purchase of the annuity. At 5 per cent the present price to be paid for a 25 years' annuity is 14 years' purchase of annuity. These annuity tables can be applied to the valuation of mine shares, and they have been so applied by the investors in South African mines. We applied the method recently, as quoted above by our correspondent. Of course, as a rule, mining enterprises do not lend themselves to such logical

Number of Years' Purchase of Dividend to Yield 6 *to* 10 *per Cent. Income and Redemption of Principal* (5 *per Cent. Compound Interest).*

Life.	At 5 per Cent.	At 6 per Cent.	At 7 per Cent.	At 8 per Cent.	At 9 per Cent.	At 10 per Cent.
1	·95	·94	·93	·93	·92	·91
2	1·86	1·83	1·81	1·78	1·76	1·74
3	2·72	2·67	2·62	2·58	2·53	2·49
4	3·54	3·46	3·39	3·31	3·24	3·17
5	4·33	4·21	4·10	3·99	3·89	3·79
6	5·01	4·92	4·76	4·62	4·49	4·36
7	5·78	5·62	5·40	5·21	5·03	4·87
8	6·46	6·21	5·97	5·75	5·53	5·34
9	7·11	6·80	6·51	6·25	6·00	5·76
10	7·72	7·36	7·02	6·71	6·42	6·14
11	8·30	7·89	7·50	7·14	6·81	6·50
12	8·86	8·38	7·94	7·54	7·16	6·81
13	9·39	9·85	8·36	7·90	7·49	7·10
14	9·90	9·30	8·74	8·24	7·79	7·39
15	10·38	9·71	9·11	8·56	8·06	7·61
16	10·84	10·10	9·45	8·85	8·31	7·82
17	11·27	10·48	9·76	9·12	8·54	8·02
18	11·69	10·83	10·06	9·37	8·76	8·20
19	12·08	11·16	10·33	9·60	8·95	8·37
20	12·46	11·47	10·59	9·82	9·13	8·51
21	12·82	11·76	10·83	10·02	9·29	8·65
22	13·16	12·04	11·06	10·20	9·44	8·77
23	13·49	12·30	11·27	10·37	9·58	8·88
24	13·80	12·55	11·47	10·53	9·71	8·99
25	14·09	12·78	11·65	10·67	9·82	9·08
26	14·37	13·00	11·82	10·81	9·93	9·16
27	14·64	13·21	11·98	10·94	10·03	9·24
28	14·90	13·41	12·14	11·05	10·12	9·31
29	15·14	13·59	12·28	11·16	10·20	9·37
30	15·37	13·76	12·41	11·26	10·27	9·43
31	15·59	13·93	12·53	11·35	10·34	9·48
32	15·80	14·08	12·65	11·43	10·41	9·53
33	16·00	14·23	12·75	11·51	10·46	9·57
34	16·19	14·37	12·85	11·59	10·52	9·61
35	16·37	14·50	12·95	11·65	10·57	9·64
36	16·54	14·62	13·03	11·72	10·61	9·68
37	16·71	14·74	13·12	11·78	10·65	9·71
38	16·87	14·85	13·19	11·83	10·69	9·73
39	17·02	14·95	13·26	11·88	10·73	9·76
40	17·16	15·04	13·33	11·93	10·76	9·78
45	17·77	15·46	13·60	12·11	10·88	9·86
50	18·25	15·76	13·80	12·23	10·96	9·92

treatment, as investors rarely lock up their scrip for five or ten years, either actually in a safe or mentally, by their way of regarding their commitments. But the mine which has ceased to be a prospect—essentially a gamble—and has developed even beyond the early stages, when it is a highly speculative risk, to that stage of assured productiveness which warrants the application of the term 'investment'—such a mine can be valued in a logical manner or else it should be let alone. For the convenience of our readers we add the annuity tables referred to, as they appear in 'The Mines of the Transvaal,' published by *The Statist,* a London financial journal which has done good work in this department of mining business.—EDITOR.)

At one time the mines of India produced all the diamonds of the world; now more diamonds are obtained at the De Beers mines in the Transvaal in one hour than are recovered in the entire Indian Empire in a year. The garnet production of India is four times that of the diamond in value. In the fiscal year 1903, the De Beers Consolidated Mines recovered diamonds valued at $26,205,865.